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JOURNAL OF ELECTRICITY POWER AND GAS

TELEPHONE NUMBER

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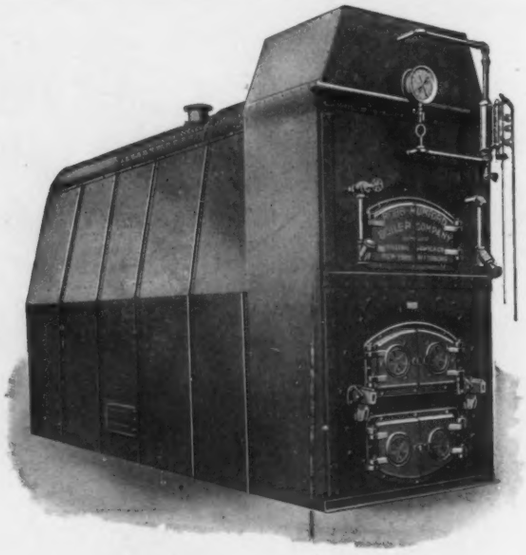

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JOURNAL OF ELECTRICITY
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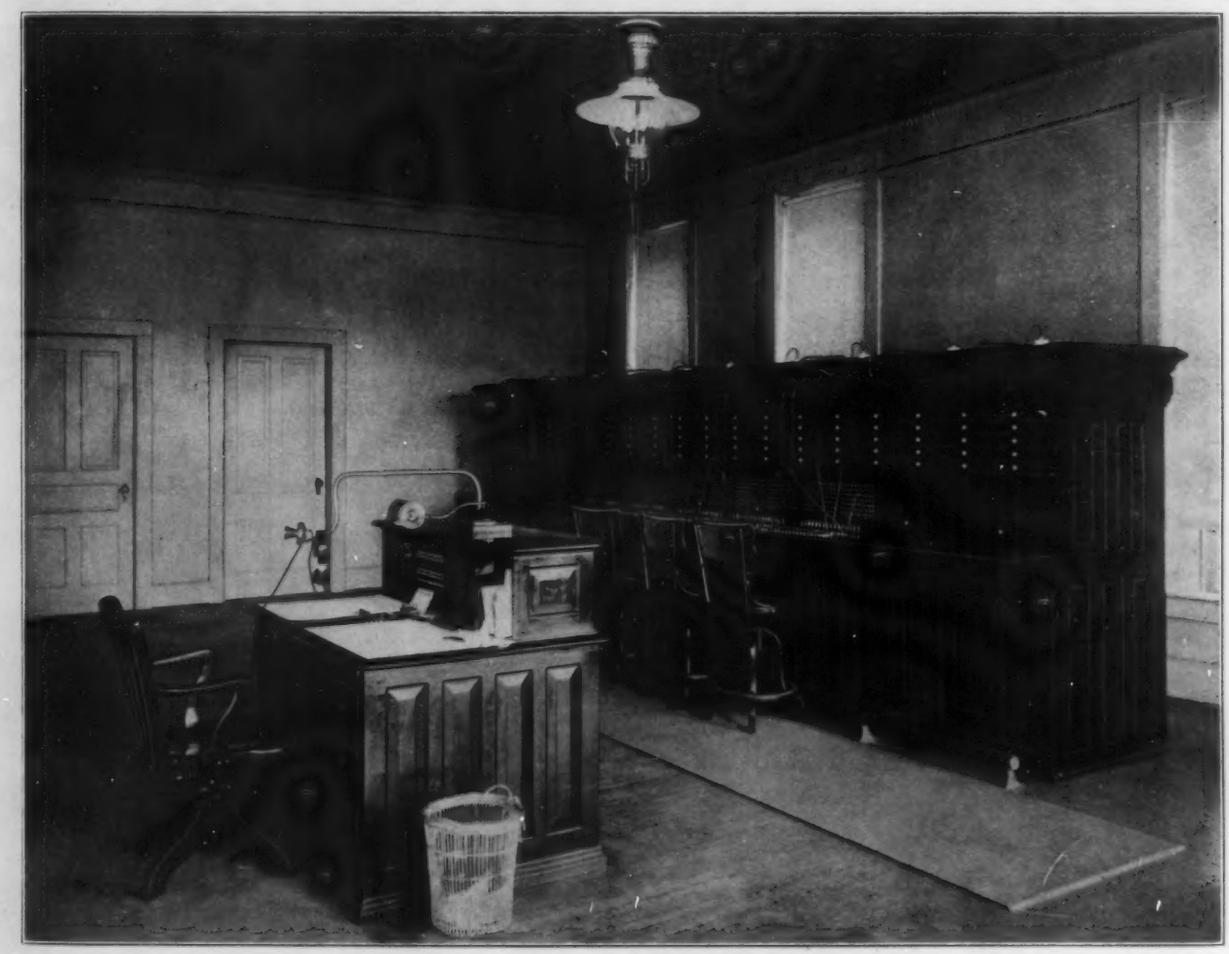
VOLUME XXII. SAN FRANCISCO, MARCH 13, 1909 NUMBER 11

A MICHIGAN TELEPHONE SWITCHBOARD.

The accompanying illustration shows a model switchboard and telephone equipment of a recent exchange installation at Coldwater, Mich. It will be noted that the exchange equipment consists of three sections of six-panel, three-position, multiple-type switchboard, each section having an ultimate capacity of 3000 multiple jacks and 540 answering jacks and lamps. Five hundred and sixty common battery, 50 rural and 40 toll lines were installed in connection with the new exchange equipment. The cord circuits in each local operator's position are of the double lamp supervision with individual four-party line ringing and listening keys. The operator's telephone sets are equipped with suspended type transmitters. Ten incoming rings through toll trunk circuits were installed between the local switchboard and the toll board.



Switchboard and Telephone Equipment at Coldwater, Michigan.

At first one section of the two-position non-multiple toll board was installed having a present equipment of 40 toll lines. These toll lines were provided with switching keys so wired that the same may be switched to the local switchboard for night toll service. Ten recording toll trunks were multipled in each section of the local switchboard and cabled to the toll board. The cord circuits at each position of the toll board were of the universal type with double lamp supervision and single party line ringing and listening keys.

In the foreground will be seen a one-position chief operator's deck which was equipped with the necessary listening-in taps, lines to local switchboard, toll board and wire chief's desk for supervising the service.

There was also a one-position wire chief's desk installed,

equipped with lines and testing trunks to local switchboard, also lines to chief operator's desk and toll board, and a testing trunk to main frame. A testing cord circuit is provided with standard voltmeter for making all of the necessary tests in an exchange of this type.

In this exchange there is a main distributing frame having a present framework of 700 subscribers' lines. This frame is equipped with arresters of the Kellogg type for 560 subscriber's 50 rural and 40 toll lines.

There is also an intermediate distributing frame having a present framework for 700 subscriber's lines. It may be stated that the power equipment installed in this exchange consists of one set of eleven cells of electric storage batteries, one motor generator charging set, one slate power switchboard, two-four-frequency vibrating harmonic pole changers, one gasoline engine and one belted changing generator. It was installed by the Kellogg Switchboard and Supply Company of Chicago.

PRELIMINARY CENSUS REPORT ON TELEPHONES.

Number of Stations or Telephones, by States, December 31, 1907.

	Total	Independ't (non-Bell)	Bell (American) T. & T. Co.	Independ't Stations connected with Bell System
United States	6,118,578	2,986,515	3,132,063	(1)835,880
Alabama	40,481	14,985	25,496	3,944
Arizona	6,203	3,148	3,055	.....
Arkansas	49,576	32,150	17,426	10,265
California	237,672	65,977	171,695	9,607
Colorado	65,908	4,473	61,435	1,620
Connecticut	63,898	1,815	62,083	352
Florida	17,522	11,160	6,362	3,691
Georgia	62,260	26,204	36,056	9,072
Idaho	16,394	5,754	10,640	1,288
Illinois	558,585	285,322	273,263	109,101
Indiana	289,452	216,990	72,462	50,065
Iowa	332,545	279,773	52,772	74,806
Kansas	200,233	161,913	38,320	66,880
Kentucky	93,996	51,796	42,200	9,038
Louisiana	35,692	6,184	29,508	4,351
Maine	53,134	16,024	37,110	7,830
Maryland, D. C. and Del.	110,282	19,896	90,386	217
Massachusetts	209,383	5,324	204,059	650
Michigan	209,842	106,049	103,793	30,933
Minnesota	171,479	114,618	56,861	46,547
Mississippi	37,627	13,567	24,060	5,235
Missouri	312,527	220,823	91,704	82,393
Montana	17,168	8,118	9,050	846
Nebraska	153,279	105,610	47,669	45,252
Nevada	4,601	2,081	2,520	734
New Hampshire	28,920	6,488	22,432	2,482
New Jersey	116,988	19,134	97,854	831
New Mexico	6,653	3,476	3,177	759
New York	685,512	180,759	504,753	23,992
North Carolina	37,104	20,597	16,507	4,714
North Dakota	34,087	26,635	7,452	10,542
Ohio	495,636	312,278	183,358	29,284
Oklahoma	68,125	38,009	30,116	35,570
Oregon	49,629	16,223	33,406	10,675
Pennsylvania	450,403	174,582	275,821	11,976
South Carolina	20,911	7,872	13,039	1,867
South Dakota	48,405	44,751	3,654	25,939
Tennessee	71,130	25,758	45,372	9,241
Texas	187,862	108,832	79,030	30,334
Utah	30,630	10,528	20,102	451
Vermont	30,823	13,917	16,916	7,020
Virginia	56,541	24,118	31,423	4,447
Washington	98,846	35,652	63,194	9,168
West Virginia	62,144	46,609	15,535	3,238
Wisconsin	158,875	89,005	69,870	36,366
Wyoming and R. I.	30,605	1,538	29,067	1,267

[1]Figures furnished by American Tel. and Tel. Co. included the total for Independent.

German telephone rates will be increased by a measure now before the Reichstag. The bill proposes to abolish the present system whereby Berlin subscribers got an unlimited service for $43.20 a year, substituting an annual rental charge of $24 for telephones, with an additional fee of 1 cent for every connection made. The bill affects all Germany, but its provisions would be felt especially in Berlin, where it is computed that the result would be the raising of the average annual cost of business telephones to $72 or $96, or even in the case of some firms to $144.

REPORT UPON PACIFIC TELEPHONE AND TELEGRAPH COMPANY, SAN FRANCISCO.

By C. L. Cory.

To the Honorables, the Mayor and the Board of Supervisors, of the City and County of San Francisco, San Francisco, California:

Gentlemen: In compliance with your resolution No. 2517 (New Series) dated July 14th, 1908, I have made a personal inspection and examination of the complete equipment of The Pacific Telephone and Telegraph Company in San Francisco, including its books, records, engineering data, etc., and beg herewith to submit the following

REPORT:

The information required by your resolution is included under three headings, as follows:

1. The true valuation of the plant of the Company in San Francisco on July 1st, 1908, and also all additional investments which rightfully increase this valuation from July 1st, 1908, to January 1st, 1909.

II. The number of telephones operated by the Company in San Francisco on January 1st, 1908, the additional telephones installed during each month of the year, and also the average revenue to the Company per telephone.

III. The annual cost of operation including a proper segregation of accounts.

I.

Valuation of Plant.

In determining the valuation of the plant of the Company there has been included the entire installation in San Francisco which is necessarily a part of the San Francisco exchange. All equipment and materials of every character not directly a part of this exchange and used in its operation have been excluded. In other words, no part of the general plant of The Pacific Telephone and Telegraph Company not directly a part of the San Francisco system, and actually required and used in its San Francisco business has been included.

Immediately after July 1st, 1908, the Company began to make complete and detailed inventories of the component parts of the entire San Francisco system, the methods and classifications having been previously agreed upon between the Company and myself.

These inventories were largely made jointly by a representative of the Company and a representative of myself and were compiled in forms readily and easily checked and verified by by me. The actual installation as represented by the inventories has been examined in sufficient detail by me to establish the fact that there is included only such portions of the installation as are required and used in the operation of the San Francisco exchange.

The valuation of the plant has, in every instance possible, been made on the basis of the actual cost to the company, but in all cases where the actual cost for any reason could not be determined, careful estimates were made of the probable cost.

The valuation of the various portions of the entire installation as determined is as follows:

THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY.

Exchange Plant, San Francisco, Cal.

July 1, 1908.

SUMMARY.

FIXED PLANT—

Exchange Pole Line.		
Poles	$ 179,152.49	
Cross Arms	39,434.38	
Guys	26,634.03	
Stubs	490.27	
Total		$ 245,711.17

Exchange Right-of-way		36,000.00
Exchange Aerial Cable.		
Aerial Cable	192,270.12	
Fence and House Cable	25,205.92	
Aerial Cable Terminals	40,434.54	
" " " Platforms.	373.58	
" " Bonds	1,218.96	
" " Moulding	67.45	
Fence " "	3,783.85	
Open Fuses	2,532.95	
Total		265,887.37
Exchange Aerial Wire.		
Line Wire	60,978.45	
Drop Wire	152,071.88	
Ring and Wall Wiring	31,652.13	
Bridle Wiring	2,598.63	
Total		247,301.09
Exchange Underground Conduit.		
Main Conduit	820,641.43	
Lateral Conduit	202,092.56	
Stand Pipes	2,296.84	
Manholes	130,053.87	
Handholes	37,558.99	
Total		1,192,643.69
Exchange Underground Cable.		
Main Cable	1,175,350.46	
Lateral Cables	83,920.78	
U. G. Cable Terminals	66,830.69	
Terminal Platforms	1,314.37	
U. G. Cable Bonds	3,689.43	
U. G. Cable Moulding	2,268.81	
U. G. Cable Boxing	964.74	
Total		1,334,339.28
Exchange Equipment Central Office.		
Kearny	406,321.24	
Market	245,295.54	
West	251,713.79	
Franklin	154,045.90	
Chinatown	4,024.78	
Butchertown	955.60	
Total		1,062,356.90
Exchange Equipment Substation.		
Subscribers' Sets	318,736.35	
Wiring and Miscellaneous Material	66,183.09	
Labor Installing	101,324.15	
Substation Protection	13,188.32	
Special Substation Arrangem'ts.	6,148.41	
Private Branch Exchange	238,357.86	
Public Pay Stations	13,760.93	
Total		757,699.11
Total for Fixed Plant		$5,141,937.61

MISCELLANEOUS PLANT—

Tools and Teams		$ 44,545.43
Furniture and Fixtures		15,815.34
General Supplies		65,350.71
Real Estate.		
Lots—		
Kearny Office Lot,(90%)	$ 41,976.00	
Market Office Lot	24,698.00	
West Office Lot	19,875.00	
Franklin Office Lot	31,800.00	
Pacific Office Lot	3,625.81	
Mission Office Lot	5,982.28	
Park Office Lot	7,420.00	
Executive Office Lot (66 2-3%)	113,066.67	
Mission Public Office lot	9,752.00	
Total for Lots		$ 258,195.76
Buildings—		
Kearny Office Building (90%)	$ 190,532.42	
Market Office Building	131,612.25	
West Office Building	128,921.50	
Franklin Office Building (Part)	11,118.26	
Park Office Building	8,189.20	
Executive Office Building (40% only)	21,563.35	
Mission St. Public Office Bldg.	719.54	
Barn and Stable	10,528.98	
Garage	1,052.90	
Carpenter and Paint Shop	1,754.83	
Stable Hospital	175.48	
Blacksmith Shop	175.48	
Plant Department Store Room.	175.48	
Van Ness & Eddy Public Office.	701.93	
Butchertown Office	935.91	
Sausalito Ferry Public Office.	467.95	
Total for Buildings		620,443.23
Total for Lots and Buildings		878,638.99
Total Plant Valuation, July 1, 1908		$6,146,288.08

The additional investment of the Company in San Francisco from July 1st, 1908, to January 1st, 1909, was obtained from the books of the Company, and includes the amount actually spent during that period which is properly chargeable to the capital account.

The additional investment as segregated into the different portions of the plant from July 1st, 1908, to January 1st, 1909, is as follows:

ADDITIONS TO PLANT.

July 1st, 1908, to January 1st, 1909.

Exchange Pole Line	$ 39,750.36
" Right of Way	1,877.30
" Aerial Cable	82,483.63
" Aerial Wire	38,662.66
" U. G. Conduit	51,602.35
" U. G. Cable	98,420.85
" Equipment—Central Office	49,423.68
" —Substations	126,286.46
Tools and Teams	4,105.36
Furniture and Fixtures	6,808.62
General Supplies	56,630.35
Real Estate	50,840.13
Construction in Process on January 1st, 1909	15,089.99
Total	$621,981.74

The total investment represented in the various portions of the plant on January 1st, 1909, also on July 1st, 1908, and the increase in investment during the period from July 1st, 1908, to January 1st, 1909, are given below:

THE PACIFIC TELEPHONE AND TELEGRAPH COMPANY.

Exchange Plant, San Francisco, Cal.

July 1st, 1908, and January 1st, 1909.

	Valuation July 1, 1909.	Additions to Plant July 1, '08, to Jan. 1, '09.	Valuation Jan. 1, 1909.
Exchange Pole Line	$245,711.17	$39,750.36	$285,461.53
" Right of Way	36,000.00	1,877.30	37,877.30
" Aerial Cable	265,887.37	82,483.63	348,371.00
" Aerial Cable	247,301.09	38,662.66	285,963.75
" Underground Conduit	1,192,643.69	51,602.35	1,244,246.04
" Underground Cable	1,334,339.28	98,420.85	1,432,760.13
" Equipment—Central Office	1,062,356.90	49,423.68	1,111,780.58
" Equipment—Substations	757,699.11	126,286.46	883,985.57
Tools and Teams	44,545.43	4,105.36	48,650.79
Furniture and Fixtures	15,815.34	6,808.62	22,623.96
General Supplies	65,350.71	56,630.35	121,981.06
Real Estate	878,638.99	50,840.13	929,479.12
Construction in Process, Jan. 1, 1909		15,089.99	15,089.99
Totals	$6,146,289.08	$621,981.74	$6,768,270.82
Valuation of Plant, July 1, 1908			$6,146,289.08
Additions to Plant, July 1, 1908, to Jan. 1, 1909			$ 621,981.74
Valuation of Plant, Jan. 1, 1909			$6,768,270.82

II.

Number of Telephone Stations and Average Revenue.

The number of telephones installed and in operation January 1st, 1908, the number connected, disconnected and net gain for each month during the year 1908, also the telephones in operation on the first of each month of 1908 and on January 1st, 1909, are given below:

	Connected.	Disconnected.	Net Gain.	1st of Month.
January	1,659	970	689	*35,367
February	1,981	988	993	36,056
March	2,014	1,275	739	37,049
April	2,366	1,144	1,222	37,788
May	2,195	1,266	929	39,010
June	1,906	1,389	517	39,939
July	1,903	1,190	713	40,456
August	2,148	1,078	1,070	41,169
September	3,138	1,006	2,132	42,239
October	2,647	1,056	1,591	44,371
November	1,787	578	1,209	45,962
December	1,939	577	1,362	47,171
	25,683	12,517	13,166	
Total Stations January 1, 1909				**48,533

*Including 211 Private Branch Switchboard Stations.
**Including 508 Private Branch Switchboard Stations.

From these figures it will be seen that the net gain in telephones in operation for the year 1908 was 13,166, which is a gain of 37.2 per cent over the number in operation on January 1st, 1908.

The average revenue per telephone for each month during the year and also the average revenue per telephone for the first six months and for the last six months is shown in the following statement:

MONTHLY STATEMENT OF STATIONS IN SAN FRANCISCO FOR 1908.

Month.	Number on 1st.	Net Gain during Month.	Average for Month.	Revenue from Stations.	Ave. Rev. per Station.
January	35,367	689	35,711	$156,980.53	$4.396
February	36,056	993	36,552	153,571.86	4.201
March	37,049	739	37,418	160,056.65	4.277
April	37,788	1,222	38,399	162,689.36	4.311

May	39,010	929	39,474	166,149.17	4.209
June	39,939	517	40,197	164,967.17	4.103
July	40,456	713	40,812	150,753.74	3.694
August	41,169	1,070	41,704	153,588.33	3.683
September	42,239	2,132	43,305	162,096.49	3.743
October	44,371	1,591	45,166	166,138.63	3.678
November	45,962	1,209	45,566	172,139.67	3.696
December	47,171	1,362	47,852	181,991.49	3.803

Average Revenue per station—Jan. 1st to June 30th.....$4.233
Average Revenue per station—July 1st to Dec. 31st.....$3.714

The average revenue per station as given is obtained from the total revenue from stations and the total number of stations, including extensions, private branch exchange stations, dead-head telephones, etc.

The reduction of the average revenue from $4,233 for the first six months to $3,714 for the last six months is due in part to the reduction in rates on July 1st, 1908, and in part to the increase in the number of telephones in operation.

The average revenue per telephone for the different classes of service during December, 1907, and during December, 1908, is given below and shows the effect of the reduced rates, beginning July 1st, 1908.

	December, 1907	December, 1908
Business Measured—		
No. of Stations	1,989	2,702
Total Revenue	$26,240.02	$32,936.26
Ave. Revenue per Station	$13.19	$12.19
Business Prepayment—(Nickel in Slot).		
No. of Stations	7,716	9,690
Total Revenue	$48,847.50	$58,933.05
Ave. Revenue per Station	$6.33	$6.08
Residence Unlimited—		
No. of Stations	5,823	8,010
Total Revenue	$22,107.50	$24,829.15
Ave. Revenue per Station	$3.80	$3.10
Residence Measured—		
No. of Stations	(None)	447
Total Revenue		$1,309.15
Ave. Revenue per Station		$2.93
Residence Prepayment—		
No. of Stations	7,427	9,219
Total Revenue	$12,557.10	$16,302.25
Ave. Revenue per Station	$1.69	$1.77
Private Branch Exchanges—		
No. of Stations	7,778	11,398
Total Revenue	$25,330.56	$30,136.30
Ave. Revenue per Station	$3.25	$2.64
Extensions—		
No. of Stations	3,280	5,604
Total Revenue	$3,268.65	$2,811.50
Ave. Revenue per Station	$1.00	$.50
Miscellaneous—		
No. of Stations	491	675
Total Revenue	$5,819.36	$6,337.19
Ave. Revenue per Station	$11.85	$9.39

COST OF OPERATION AND SEGREGATION OF ACCOUNTS.

The statement of Earnings and Expenses for the year 1908, as filed with the City, is as follows:

	First 6 Mos.	Last 6 Mos.	Total.
REVENUE—			
Local	$ 964,414.74	$ 986,708.35	$1,951,123.09
Private Line	15,985.47	15,332.50	31,317.97
Long Distance	28,688.27	34,344.76	63,033.03
Real Estate	52,530.00	52,730.00	105,260.00
Total	$1,061,618.48	$1,089,115.61	$2,150,734.09
EXPENSES—			
General	$ 30,267.70	$ 28,367.11	$ 58,634.81
Operating	202,759.04	223,227.13	425,986.17
Maintenance—			
Sal. & Wages	205,576.76	189,912.42	395,489.18
Material	134,323.54	120,997.03	255,320.57
Traveling	11,305.92	11,062.91	22,368.83
Conduit, Pole & Roof Rent	2,160.31	(Credit)564.99	1,595.32
Rent, Light & Heat	54,593.72	54,212.14	108,805.86
Directory	3,665.09	7,575.47	11,240.56
Advertising and Canvassing	7,856.27	11,662.72	19,518.99
Miscellaneous	41,430.48	43,345.67	84,776.15
Instrument Rental	45,531.89	46,047.07	91,578.96
Taxes, Personal	24,572.14	28,334.15	52,906.29
" Real Estate	3,277.63	3,788.94	7,066.57
Real Estate Expense, not including Taxes or Ins.	22,987.22	24,653.30	47,640.52
Insurance, Personal	6,177.29	10,003.47	16,180.76
" Real Estate.	1,721.67	2,720.85	4,442.52
Total	$ 798,206.67	$ 805,345.39	$1,603,552.06
Net Revenue	$ 263,411.81	$ 283,770.22	$ 547,182.03

An analysis of the expenses as set forth in the above statement shows that the main headings are made up as follows:

General—
Salaries and Wages.
Rent, Light and Heat.
Travelling.
Postage, Printing and Stationery.
Legal.

Operating—
Salaries and Wages.

Maintenance, Salaries and Wages—
Current Repair, Salaries and Wages.
Reconstruction, Salaries and Wages.

Maintenance Material—
Current Repair, Material.
Reconstruction, Material.

Conduit, Pole and Roof Rent—
Balance of credits and debits charged to this account.

Rent, Light and Heat—
Operating—Rent, Light and Heat.
Current Repair—Rent, Light and Heat.
Reconstruction—Rent, Light and Heat.

Directory—
Balance of credits and debits charged to this account.

Miscellaneous—
Uncollectable.
General Incidental.
Operating Incidental.
Operating, Postage, Printing and Stationery.
Current Repair Incidental.
Reconstruction Incidental.
The other headings are self-explanatory.

This classification does not follow the classification used by the Company in keeping their accounts. Without an investigation of the Company's books the statement given above would be valueless for a comparison from year to year of the various expenses. For instance, under the head of "Operating" the statement shows an amount of $425,986.17, which is made up entirely of salaries and wages, while rent, light and heat for operating is an unknown amount appearing in the total for rent, light and heat; also, postage, printing and stationery and incidental expenses for operating appear only in the total for miscellaneous. Again, the amount for rent, light and heat does not include all of the expenses under this heading, as in the amount given under "General" is included an amount for rent, light and heat.

However, the statement of the Company for the year 1908, showing the revenue and expenses, follows the same form as that presented to the Supervisors for the year 1907, which statement was submitted on February 10th, 1908. For this reason the statement of revenue and expenses of the Company for the year 1908 was submitted in the form as filed in order that it might be readily compared with the statement submitted for the year 1907.

I have investigated the classification of accounts as used by the Company, and, in general, have no criticism to make upon their methods. However, it would seem to me that the revenue and expense accounts respectively should contain all revenues and all expenses and not have, as is the present practice in the cases of directory and conduit, pole and roof rent, only the net expense appear as expense. This change would, of course, only affect the gross revenue and gross expenses, and not change the net revenue.

Following the classification used by the Company in keeping their accounts, the expenses for the year 1908 would be segregated as follows:

EXPENSES—

	First 6 Mos.	Last 6 Mos.	Total.
General	$ 51,112.43	$ 52,454.75	$ 103,567.18
Operating	276,811.05	302,960.01	579,771.06
Maintenance—			
Current Repair	107,762.38	120,144.55	227,906.93
Reconstruction	256,092.66	214,803.29	470,895.95
Instrument Rental	45,531.89	46,047.07	91,578.96
Conduit, Pole and Roof Rent	2,160.31	(Credit)564.99	1,595.32
Ins., Personal Property	6,177.29	10,003.47	16,180.76
" Real Estate	1,721.67	2,720.85	4,442.52
Taxes, Personal Prop'ty	24,572.14	28,334.15	52,906.29
" Real Estate	3,277.63	3,788.30	7,066.57
Real Estate	22,987.22	24,653.30	47,640.52
Total	$ 798,206.67	$ 805,345.39	$1,603,552.06

The expenses as set forth in this statement are made up as follows:

GENERAL.

The amount charged to this account is a proportion of the total general expense of the Company under the following subdivisions:

Salaries and Wages.

This account is charged with the salaries of the president, vice-president, general manager, secretary, treasurer, auditor, attorney, engineer, commercial, general and division superintendents; and other general officers and their office forces.

Rent, Light and Heat.

This account is charged with the rent, light, heat and care of the offices occupied by the president, vice-president, general manager, secretary, treasurer, auditor, attorney, engineer, commercial, general and division superintendents; and other general officers and their office forces. If building is owned by the Company, rent should be computed on portion used for officers and employees named.

Traveling.

This account is charged with the traveling expenses of all general officers and employees, while engaged upon the general business of the Company.

Posting, Printing and Stationery.

This account is charged with the cost of books, blanks, printing (except directories and advertising for new business), stationery and postage for the use of all departments of the Company, excepting that part charged to operating.

Legal

This account is charged with the retainers and fees of attorneys, other than the regular salaried counsel of the Company, who are employed in cases of suit or for other legal service.

Incidental.

This account is charged with items of small amount pertaining to the general offices which cannot otherwise be properly classified.

Uncollectible.

This account is charged with the uncollectible bills of the Company.

OPERATING.

Salaries and Wages.

This account is charged with the salaries and wages of the commercial managers, managers, recorders, cashiers, collectors, clerks, and other exchange employees whose work is incident to this department, excepting those employees engaged upon advertising and canvassing and directory work.

This account is charged with the salaries and wages of the general superintendent of traffic, division superintendents of traffic, traffic engineer, supervisor of traffic, supervisor of telegraph, traffic agents, district traffic chiefs, traffic inspectors and office forces of traffic department officials.

This account is charged with the salaries and wages of chief operators, supervisors, monitors and operators who are attendant upon the exchange and toll switchboards of the Company in handling the traffic, matrons, pay station attendants and other exchange employees whose work is incidental to this department.

Rent, Light and Heat.

This account is charged with the rent, light, heat and care of space occupied by exchange managers and their employees, except the space occupied by the construction and maintenance force.

Postage, Printing and Stationery.

This account is charged with the expense of postage, printing and stationery chargeable to operation.

Directory

This account is charged with the salaries of the superintendent of catalogue department and his office force, the rent, light, heat and care of offices occupied by same, and the cost of printing and distributing directories.

Advertising and Canvassing.

This account is charged with the salaries and travelling expenses of canvassers, except for private lines; rent, light, heat and care of space occupied by same; commissions paid for securing new subscribers, and all expenses of advertising for new business.

Incidental.

This account is charged with items of small amount pertaining to the exchanges, which cannot otherwise be classified.

MAINTENANCE.

This account is subdivided on the books of the Company under two general divisions. These divisions are maintenance-current repair and maintenance-reconstruction, and are defined as follows:

Maintenance-Current Repair.

Under this heading is included the cost of keeping the existing property in good working condition, including the replacement of those parts of the plant whose normal life does not exceed one year.

Maintenance-Reconstruction.

Under this heading is included the expense of replacing portions of the plant whose normal life is more than one year. Maintenance reconstruction expense is charged with the cost of the old property, including the cost of its removal, less the value of material therefrom used upon the new work or returned to the supply department. New construction is charged with the excess of the expenditure over the amount so charged to maintenance reconstruction, and to the supply department for material returned.

INSTRUMENT RENTAL.

This account is charged with rental on instruments used for exchange and toll purposes.

CONDUIT, POLE AND ROOF RENT.

This account is charged with the amounts paid for rental of underground conduits, attachments to poles of other companies, or for roof privileges.

REAL ESTATE.

This account is charged with all expense for care of real estate and buildings owned by the Company, including the cost of heating, lighting, water and elevator service, and repairs.

A separate and complete set of books has been kept by the Company, beginning July 1st, 1908, to cover the accounts separately for San Francisco. The result has been that the work of segregation of accounts and the determination of the different items of expense has been the more readily and accurately accomplished.

In conclusion, I wish to formally acknowledge the many courtesies extended to me by the officials of the Company, with whom I have worked in connection with the securing and compiling the data required in connection with the preparation of this report. Without exception they have afforded me every facility and have freely given me all information, whether detail or general, for which I have made request.

TELEPHONES ON THE FARM.

BY M. S. ALLEN.

A few years ago telephones were as rare in the country as airships are today. They were looked upon as one of the luxuries to be enjoyed only by the very well-to-do in the cities and larger towns, and the few occasions country people had to employ long distance lines, with the accompanying high charges, emphasized this feeling. During the last few years, however, there has been an almost complete reversal of feeling in this respect, and there is now hardly a township in the country where there is not at least one rural line.

This line may begin eight or ten miles out in the open country and extend into a town where there is an exchange, or it may begin in one man's house and zigzag along the country roads for fifty miles, with a telephone in every farm house or crossroads store which it passes. The latter class of line is the one which has done most to popularize telephones. Each subscriber owns a share in the line and helps to build it, and each one owns his own telephone, keeps it in order, and helps keep the line in working order.

John Peters is connected to a line which is sixty-five miles long and has seventy-two or three other instruments on it. His friend, Jim Nixon, is on the same line, six miles away, and when John wants to talk to Jim, he takes down his receiver and says, "Hello, Jim," knowing that half the time Jim and most of the other people on the line are either trying to talk to some one or listening to the news of the country. If Jim doesn't answer, John rings for him, trusting to get him with only one ring, and knowing perfectly well that every person between and on both sides of them will immediately listen on the line to see what is going on. It was on such a line as this that the old lady was found knitting with the receiver tied to her head in such a way that she could overhear every word passing over the line. She was very indignant when told that her action prevented the other people on the line from ringing one another and put the line out of order so far as calling was concerned, and said she was just going to send her son to report that the line was out of order because she hadn't heard a word all the morning.

Country doctors were among the first to appreciate the advantages to be gained from rural telephone lines, and spent many days convincing their patients and neighbors that with a telephone many trips at night and in bad weather could be avoided. They were only too glad to put small five or ten-line switchboards in their homes, in which the long lines would terminate, and to do the necessary switching of one line to another for a nominal charge, because doing so insured them all of the medical business in their district, and saved them many long drives on muddy or dusty country roads. Many doctors who were located in towns of several hundred people started out with a few lines this way, and gradually developed the business until they now have exchanges with several hundred subscribers, the revenue from which makes a most welcome addition to their incomes.

The larger operating companies have recognized for a long time the necessity for the development of country lines about their exchanges and toll stations, but have been unable to accomplish this development because of the long lines required and also because the people in the open country either could not afford to pay the rates such service would require, or did not realize that telephone service was worth the price asked. A solution to this problem has been found, however, and it will be only a short time comparatively before there will be just as many telephones per capita outside of the cities and towns as there are now in them.

The plan provides that a group of people living along a road shall get together, organize a small mutual company, cut and set their own poles, install their own telephones, string their own lines up to the exchange limits, and there connect with the operating company. They pay a nominal switching charge for the purpose of talking with the subscribers to that exchange, and regular toll charges from that exchange on long distance calls through it to distant points. This enables the people in the open country to enjoy the same telephone service that their city friends have, to talk to their relatives or brokers, to buy the necessaries of life, sell the produce of the farms, or, when they are in the city, to call up and learn if anything is wanted at home before they start back again.

When these country lines were first built, the work and material were of the crudest sort. One line consisted of a single fence wire, strung from house to house, and the telephones were nothing more than empty tin cans with an end of wire stuck through the perforated bottom, and fastened there with a penny which had a hole in it, through which the wire protruded. These telephones were like the ones children make when they are running a string forty or fifty feet from one window to another, but this line was miles long, and the instruments were unprotected by lightning arresters. One day when some one was trying to use the line during a thunder storm, lightning struck the line and killed him. That was the end of "penny telephones" and the beginning, in that section at least, of knife switches with which to cut out telephones during thunder storms. These switches were just as crude as the penny instruments, and consisted of large, heavy, kitchen spoons. A nail was driven through the bowl of the spoon into the wall, and the line wire terminated on it. At the lower end of the spoon handle were two more nails a few inches apart. To one nail the telephone was connected and to the other the ground wire. There was enough spring in the bow of the spoon handle to make a pretty good connection, and the switches did the work for which they were designed.

Nowadays, however, telephone lines and instruments are of the best. Fence wire no longer appeals to the farmer because it is cheap, for he realizes that a well built line of good material will not only give better service during its life, but will last a great deal longer than a poorly constructed one of cheap material. While long lines are still used, they are cut into sections, or terminated in small switchboards, and the number of subscribers on a line is usually from six to fifteen. Many of the lines are metallic circuits of No. 12 BB wire, and brackets and insulators are used instead of porcelain knobs. The material for such a line, exclusive of poles, costs only about $14 per mile, and as the subscribers usually average one per mile and can cut their poles on their own places, the expense per man is not great. The best telephones, with all the material necessary to install them, can be purchased for $13 or $14 per set, making the initial cash investment for an instrument and one mile of metallic circuit material only about $27.50, or, if a grounded line is strung, $20.

This puts the cost of telephones within the reach of almost every one, and at the rate at which they are being put in, it will be but a short time before a person can go into a farm house in any part of the South and talk to any part of the country.—Southern Electrician.

Pacific Radio-Telegraph Company, Ltd., was organized in England last month to acquire powers for the construction, maintenance and working of a system of intercommunication by means of radio-telegraphy between the islands of the Pacific Ocean and the territories of Australia and New Zealand.

A mail subway is to be built between the various post-offices and railway stations of Berlin. An automatic system of electric cars without motormen will carry the mail at a speed of twenty-five miles an hour.

Telephones in safe deposit vaults have been installed by a New York bank for the convenience of patrons who wish to consult financial men without taking their securities from the vaults.

PROCEEDINGS PACIFIC COAST ELECTRIC VEHICLE CONVENTION, SAN FRANCISCO, FEBRUARY 19-20, 1909.

(Concluded.)

DISCUSSION ON "RELATION OF CENTRAL STATIONS TO THE AUTOMOBILE BUSINESS."

The Chairman: This subject is open for discussion.

Mr. C. T. Ryland: In the future the central station man might own all the batteries and the owners the vehicles. The central station man or some big concern would rent charged batteries, taking them back when they were discharged and replacing them by others. He would then have standard sets; the owners would then get rid of the bugbear of taking care of the batteries. If the big companies handle the batteries that way, a big part of the business would be taken care of automatically.

The Chairman: That might be the solution of touring with electric automobiles, if charging stations were established and the companies owned the batteries.

Mr. F. T. Kitt: I think there is a storage battery company that makes a practice of that, and they trade them as they do "Prestolite." I think for six-cell spark batteries they renew them and give you another battery. It is not likely that the central station could afford to operate that way with a vehicle battery because it would be misused. They would get into many difficulties.

Mr. G. E. C. Holberton: While I think that Mr. Kitt is right in what he says, I will say that central stations will welcome any device that will tend to flatten the load curve. We have made already special prices for charging automobile batteries. But I will say that in California the price does not appear so attractive, because here rates for general power use are very much lower than in the East. I think that is true all over the Coast. From what I can gather from people who come out from the East our rates are now very low. I think that we cannot adopt the suggestion of having any clause in the contract for using current off the peak. The only way is to use two meters and charge a certain rate during certain hours, and then if they use current off the peak they will get a lower rate. The rate in Oakland for automobiles is five cents, and then from that there is a discount for consumption. But in San Francisco the lighting rate already is scaled down to four cents. To go below that would be a very low rate. So far we have had very little call for charging in San Francisco. Whether that is due to the fact that the hills are against the use of the electric I do not know: I presume it is. As far as our own system is concerned, I think Oakland has been the largest field so far. I believe that Oakland, Stockton and Sacramento are all good places for the introduction of electric automobiles; for many reasons the conditions there are ideal. The electric vehicle, it seems to me, appeals most to those who desire to operate their own vehicles, and particularly ladies, while shopping. Even the owners of larger gasoline cars also have their electric runabouts. If there are any questions that any of the gentlemen desire to ask as to our attitude in the matter I would be very glad to answer them. As I have already stated in general we welcome the electric automobile, and anything else that will consume current.

The Chairman: We understand that any central station company would welcome the automobile if the automobile would come into its town and use current; but I would like to ask what their attitude is toward the electric automobile—that is, do you believe that it is a success? If you do not now I certainly think you will when this convention is over. We believe that it will be such a great advantage to the central station that the central station people will not only welcome it but take means to bring it about—in advertising; and first and foremost, by purchasing electric automobiles for their own use. They are especially well situated to do that for the reason that they have current which they can use for charging and on which the profit is, of course, eliminated. Those are the points that we would like to bring out here—that the central station should take means to push the use of electric vehicles just the same as they do flat irons, curling irons, sewing machine motors, and so forth, which really consume a very small proportion of current.

Mr. A. C. Downing: One of the best illustrations of power stations taking hold of this matter is the Union Gas & Electric Company of St. Louis. They have taken on the agency for three electric machines, operate a large garage in connection with their business, and have developed the electric automobile business in St. Louis to a great extent; in fact, three years ago there were not six electric machines; today the Union Gas & Electric Company are caring for 75 every night and another concern 125, and many are charged at home, showing what can be done in three years. They advertise it throughout the city with electric signs, large sign boards electrically lighted and all through their different advertising mediums, just the same as they do with their curling irons and smaller apparatus.

Mr. W. L. Harvey: I would like to ask Mr. Holberton what he would figure it would cost to charge an ordinary automobile at the rate charge in San Francisco, say, put the rate at 5½c per kilowatt hour. I ask for this reason, that in Buffalo their rate is 8½c per kilowatt, and they figure up the expense at about 40 cents a day. I am taking care of two machines and I have taken particular pains to watch my bills and I find that my two machines cost me only about eight dollars a month to charge, that is, the increase in my bills has been about eight dollars per month, using direct current. This includes rheostat losses. The average run of an automobile in San Francisco is thirty miles per day. There are days when they do not go out, and sometimes they need a quarter of a charge and sometimes a full charge; but I think the figures are right, because they are given to me by a large company in the East where they are taking care of 150 machines; and figuring on my gasoline expense I would accept those figures as correct.

Mr. W. D. Vance: You can use up the full charge in thirty miles.

Mr. W. Harvey: We realize that. In a gasoline car I have put a man in charge who used 26 gallons of gasoline between here and San Leandro. I can put another driver on there that can go clear to San Jose on 3½ gallons. The same proposition applies to the electric vehicle. I have found out that you have got to make a machine so absolutely fool-proof that no fool, no matter how big a fool he is, can hurt the machine.

The Chairman: I am glad Mr. Harvey brought out the point that his experience shows that the average vehicle goes thirty miles per day, because in my paper this morning I made the offhand statement that most of the gasoline machines used in a city could be displaced with the electric vehicle; and that seems to be a conclusive argument.

DISCUSSION ON "THE VEHICLE MOTOR."

Mr. A. C. Downing: Will Mr. De Remer give a comparison of the electric motor in horsepower to that of the gasoline car? We are quite often asked by a prospective customer what the horsepower of our cars is. We answer him that it is not rated that way but that we have a motor of three or four horsepower as the case may be. He in turn says that a gasoline car of the same capacity has fifteen or twenty horsepower.

Mr. J. G. De Remer: In that connection, as I stated in a part of the paper, the rating of the motor is not limited, as in the case of a gasoline engine; that is, the motor will take for a short time almost everything that can be put on to it; and the rating is dependent upon the time of operation or upon the demand. For instance, you can climb a very steep hill and the motor will take several hundred per cent overload for a very short time. The rating is determined by the temperature raise only. The sizes run from about 1½ up to 5 horsepower per motor, with the possibility of a double motor equipment, or a single motor if that is sufficient.

The Chairman: The gasoline engine for its horsepower depends upon a certain area of piston and a certain pressure, and of course as the speed is reduced the power is reduced; whereas, with the electric motor, the battery efficiency is increased as the speed is reduced. It simply depends upon the resistance of your armature how much current you can get through. So that the relation between torque and power is quite different with the electric motor than with the gasoline motor; in other words, the electric motor is capable of doing a tremendous amount of work on hill-climbing which the gasoline motor would not be able to do with the same rating.

Mr. R. M. Alvord: I have seen quite a number of articles lately about a transcontinental road electrifying the load over the mountains. The same thing would apply with the gasoline engine and the electric engine. They found that on their high grades the electric motor worked better than the steam locomotive; and I think the same thing would apply with the electric motor as compared with the gasoline motor, that the economy would be much greater on the high grades.

Mr. G. A. McDougald: One of the greatest features is that the transmission is eliminated. There were some statistics gathered in the taxicab business showing that an 18-horsepower gasoline rating produced at the wheels only 3¼ horsepower; the rest was lost.

Mr. W. W. Briggs: That is an intricate problem that the gasoline men have always had. I do not understand that a gasoline engine has any fixed horsepower. When it is rated at 20 horsepower it is only at a fixed engine speed. The same thing pertains to a railway motor; it is that horsepower at a certain fixed number of revolutions, which is constantly varying. That developed in the expansion of the electric railroads, as the business developed. The old electric railway manager got horsepower fixed in his mind and it took quite a long campaign of education to disabuse his mind of the horsepower rating being applicable. As Mr. De Remer mentioned in his paper, the general method of determining a railway or vehicle

motor rating is by a time and temperature curve. Take the square root of the mean square of the current consumption and assume that that value has continuous application for a certain length of time which would heat the motor only to safe limits, and consider that the motor rating. As a result, the apparatus has been very much more satisfactory than in the past, because they found out what was needed and put the right motor on. I am satisfied that the electric vehicle men will have to carry an educational campaign of the same kind when they bring up the question of horsepower rating, because as a matter of fact, "When is a horsepower?"

Mr. W. L. Harvey: I have found that a three-horsepower motor will perform the same feat as a 24-horsepower gas engine. We have a three-horsepower motor in an electric vehicle and we do certain things that the gasoline engine people consider very good results.

Mr. J. G. De Remer: Can you attain the same speed?

Mr. W. L. Harvey: Yes, we can maintain the speed—28 or 29 miles an hour. A great many people tell me about riding 60 miles an hour. I have done it, but before I did it, I thought I was going that fast. We have a good driver going through the park at night when everybody wants to speed all the way, and all he does is to open up the muffler and make a noise, and he is going fast. That in plain English is what most people think speed is. You can take a three-horsepower electric motor and accomplish the same result without making any noise. I have seen in hill-climbing and so forth where a three-horsepower electric motor will do everything that a 20-horsepower gasoline car can do.

The Chairman: In other words, for a gasoline or electric car in a hilly city like this it is drawbar pull and not horsepower that is desired.

Mr. W. L. Harvey: Yes. They used to rate a gas engine 24 or 30. I believe there is one in the market now that rates 35-60; that is, at certain speeds of the engine and under certain conditions it is 35 horsepower; and when you give the full throttle she will develop 60 horsepower. How much power she transmits to the wheels is another question, but that is the rating.

The Chairman: I would like to have the point discussed, in regard to the consumption of energy running up a very steep hill; that is, with a very heavy drawbar pull, whether it is going to take a very large proportion of the energy of the battery to do that, or has the motor such a characteristic that you do not discharge the battery an unreasonable amount.

Mr. J. G. De Remer: I can say on that point, that the efficiency curve up to the very limit of the motor operation is fairly well maintained, that is, when taking the current which will cause it to raise to the maximum allowable temperature in a very few minutes. The efficiency drops off but a very little per cent in the maximum value. That would indicate that the power consumption is as small as can be.

Mr. A. C. Downing: The general tendencies among the constructors of automobile motors has been towards the series wound motor so that it will take care of itself on a hill. The compound or shunt wound motor tries to negotiate the hill at the same speed as on the level, thus naturally causing a great consumption from the batteries and works a hardship in that direction. The Elwell-Parker people, the manufacturers of practically the only motor of that type, have changed their motor lately and have gotten away from several of those features that they embodied in their earlier motors. Their experience was direful in some cities where the conditions were severe.

Mr. W. W. Briggs: There is a matter in this connection that I have heard of recently that might be of general interest particularly in commercial vehicle business. The manufacturers are working on a controller which is specially adapted to hilly locations. Mr. De Remer touched upon it briefly. We have developed such a controller and experimented with it and it is effective when placed in the hands of a fairly skilled operator, such a one as would ordinarily drive on a commercial machine in contradistinction to a lady. This controller will increase the field of operation of the commercial vehicle and also reduce the wear and tear on the vehicle in braking, that is, when a man comes down hill with a heavy load by the use of this controller the excess of consumption of current on the uphill is partially compensated by regeneration.

Mr. F. W. Pfaffman: Reference has been made to a compound motor. We have obtained six speeds; two of them in resistance and the third speed is what we call the normal running speed in coasting down the hill; the ammeter shows that it is charging. We find that the shunt is a very useful thing if it is properly made. The results are marvelous. The application of the electric brake in coasting down hill is different from what it is in most machines in that it does not catch the machine suddenly no matter what speed you are going at. It pulls you down gradually at high speed or low speed. It is possible to go down a very steep grade at a high speed and catch your machine at just as slow a rate as you wish by means of this brake. It is unnecessary to use a foot brake.

Mr. F. T. Kitt: Is there any draft on your batteries?

Mr. F. W. Pfaffman: There is possibly two amperes in the use of the brake; it is scarcely noticeable; it is simply the armature being held.

Mr. F. T. Kitt: I understood you to say that the ammeter showed in the opposite direction, showing that the current was going into the battery instead of out.

Mr. F. W. Pfaffman: Yes, I never noticed that except for a few minutes. It could scarcely be taken into account; it was practically of no value whatever. It only occurred when I ran with the field and the batteries in series. Of course, I am talking from the standard of the compound wound motor. I would like to discuss it more fully and give you all the facts, but I do not know the operation. I can only state the facts; I am not an electrician.

Mr. W. F. Lamme: With reference to the question just brought up about the braking, I really think there is some use made of it. I have never seen it. It is natural for it to be so. I do not think that this would occur except when the car was running at a pretty high speed. When that occurs you pull your lever back and your current will die out. You have still some residual field and that would produce some braking effect. It would not be reasonable for it to be made in any other way. As to this series question, undoubtedly the series motor is the most efficient motor and the easiest motor on the battery that can be made. The little equation that the torque is equal to the product of the magnetic field by the current running in the armature shows this. The magnetic field is made by the main current; therefore, the stronger that current, the less the total current necessary, for at the same time the speed of the apparatus is decreased. Both of these points result in less energy from the battery for a certain required torque. The compound wound motor is a little worse in that respect; it takes more current; and the shunt wound is the worst motor of the three. For instance, in going up a hill, not taking into consideration the saturation question, if we have a shunt motor, it will take, for instance, a hundred amperes; if we have a series motor it will take fifty amperes; in other words, doing the same work, the series motor is the best motor we can get for that work; and for automobile cars it is best, especially because we are limited in our battery capacity, and the weight of the battery is an important point.

The Chairman: I want to ask Mr. Lamme, on a level road what is the best motor?

Mr. W. F. Lamme: If I had a choice I would take a series wound motor for the reason that the starting ability is greater; we could start easier; and our starting devices could be made more simple. With a shunt, we could not start so well because we could not throw the whole current on the armature. In some series wound motors it is found desirable to use a little series resistance in connection with the field and the armature too. This will give a little nicer starting condition. Some people object to the little jerk we have; a little resistance in the circuit will flatten that out.

The Chairman: How about the running efficiency?

Mr. W. F. Lamme: A series motor has very frequently a sharper high efficiency point. A series motor has one point where it will run fully as high as any shunt motor, but it tapers down unless it is specially designed. A shunt motor generally ridges out or flattens out at the heavy load, because there is less copper loss. In a series wound we have copper losses both in the field and in the armature. The copper loss goes up with the square of the current.

The Chairman: Is not the attempt in the compound motor to compromise and get the best running conditions on the average?

Mr. W. F. Lamme: Possibly. In regard to the point you bring up on the level road, I think probably with a compound motor you get pretty fair results. You can do this, make a motor with very strong winding, which would be used in starting and then permit the shunt to build up afterwards, giving a combination of the two. With the shunt motor we can feed back into the battery sometimes, down a grade. But there is not so much gain as we think. I think we one time figured on that point on the Southern Pacific Railroad coming down this side of the Truckee grade; I think we gained something like 10 per cent of the energy. It hardly paid for the computation.

The Chairman: Would it not possibly obtain that in a very hilly town and it would be best to have a series motor and perhaps in a level town like Chicago to have a compound motor?

Mr. W. F. Lamme: Undoubtedly. There was another point brought out in the discussion which hinges upon this, that is, the weight of the motor. As I said before, the torque is equal to the total magnetism multiplied by the current. Notice the two terms, the magnetism and the current. You can make the magnetism large and the current can be small. That is a very important question when you come to the battery. But to make the magnetism large you have got to have a large iron circuit;

that is, you would have to have a motor with more weight than another motor might be. The question raised there is, are we reaching the greatest efficiency with reference to the size of the motor and the battery; for instance, if we would add 50 per cent to the weight of the iron in the magnetic circuit—take as an example a 200-pound motor and a 1,000-pound battery—probably we could add 5 per cent to the battery. That would mean that we could reduce the battery 5 per cent. Then we would have a better combination than in the first place, and the total weight of the car would be the same as before; but we would have less current consumed. I believe this is an important point that has never been thrashed out.

DISCUSSION ON "THE COMMERCIAL VEHICLE."

Mr. J. M. Mitchell: I would like to ask what you would consider the ordinary life of the electric automobile, everything else being equal?

Mr. A. C. Downing: Of course it is a proposition on which all will differ. Today even in Oakland there are some little electrics running on the street that were manufactured seven years ago. Outside of tires and batteries I presume the parts are the same as when the car left the factory, outside of those being replaced in wear and tear. Down at Pasadena the other day there came to my notice a little wire wheel Waverly with one of their old type A motors. The car was identical with the way it left the factory, showing that in that stage of development the car gave six or seven years' life, so that today we ought to get ten or fifteen out of the vehicle itself.

Mr. J. M. Mitchell: A commercial vehicle?

Mr. A. C. Downing: The commercial vehicle's life is figured at ten years with a depreciation of 10 per cent, the battery and tires separate.

Mr. J. M. Mitchell: I have been talking that the average life of an electric was about three times that of the gasoline cars. Is that right?

Mr. A. C. Downing: You are on the right track.

Mr. J. M. Mitchell: I have been also saying that the up-keep would be about one-third.

Mr. A. C. Downing: The application or service rendered would be the governing feature as to the up-keep. The comparison between the cost of up-keep between electric and gasoline would be hardly fair. It would be the same as comparing the cost of up-keep on the electric and that of a horse. The radius of mileage is so different that it would be hardly fair to make a comparison. But taking identical service over a period of five years, I think then that you would find your saving anywhere from 25 to 30 per cent, as you say.

Mr. G. A. McDougald: I would like to ask if the depreciation has been figured on the battery on the commercial car.

Mr. A. C. Downing: In figuring the depreciation the service also enters. For ordinary delivery work we figure 75 per cent each year and on heavy work we figure 100 to 125 per cent. That includes the replacement of large plates, the expense of washing and renewing the plates at the end of the year or as many times as they have to do it.

The Chairman: I might mention that the renewals of batteries really should be figured with reference to the ampere hours, discharge, or perhaps in charges and discharges. If the battery is completely discharged every time, then it will be with reference to ampere hours discharge.

Mr. G. A. McDougald: Have you any data on that question of the depreciation?

Mr. A. C. Downing: We have a great array of figures from various cars under various conditions, and would be pleased to go over them with you any time you would like to talk it over. Most of them are compiled from actual service; some of them are computed; but as I stated in the paper, knowing now about the battery entire, it gives a pretty fair chance to figure the exact cost of operating, provided we know the conditions. In examining concerns' delivery systems we go to such an extent that we guarantee that the cost of up-keep will not run over so many dollars per year after such an investigation has been made. With a gasoline truck it would be pretty hard to do that and come anywhere near it.

Mr. I. G. Perrin: My experience with electric trucks has been limited almost altogether to light delivery wagons and more particularly in Detroit, where five years ago there were perhaps a dozen light delivery wagons and they were decidedly successful even at that time. Those in use there were mostly of the Pope-Waverly type. They gave very good service, but the electric truck that we have now is far ahead of them.

The Chairman: Can you give us any data or ideas as to the relative saving in using electric trucks as compared with horse-drawn vehicles?

Mr. I. G. Perrin: The cost of operation would be just about one-half what it would be to operate a gasoline wagon of the same capacity for the same purpose. On the other hand, we have maintained that one electric delivery wagon of a given capacity would do about twice the amount of work that could be done by a horse-drawn vehicle. That does not give any accurate idea as to what the cost per ton mile might be.

Mr. R. M. Alvord. I would like to ask in regard to the capacity of the delivery wagons, a comparison on something between a thousand and two thousand pound for delivery work.

Mr. I. G. Perrin: The delivery wagons have a capacity of about 1500 pounds. That is the size that will come into use first, perhaps, and be used more than any other. They represent a very good example of modern electric commercial delivery wagons.

Mr. A. C. Downing: The mileage of a commercial vehicle will vary according to size from one renewal of the new batteries to two renewals; on the light delivery wagons with approximately 8000 miles, down to the five-ton truck with 4500 miles, and be graduated with the increase of the weight.

The Chairman: That does not mean an entire renewal, all plates?

Mr. A. C. Downing: That means an entire renewal. Of course there are instances where their load is less and their life is naturally going to be greater and the number of miles consequently would be more.

Mr. F. W. Pfaffman: What proportion of the work can the electric installation accomplish over the installation of horses?

Mr. A. C. Downing: The number of parcels delivered in one case was the same; they had seventeen teams and wagons, and that was being done by ten electrics were calculated to do the same work. Where the great saving was effected was in the number of drivers. So they had a saving of seven drivers and seven boys helping. One way that they accomplished that was by starting to deliver at 8 o'clock in the morning. They would cover their route by 10 and were back and took a short load at 10:30. Then they would get back to the garage and change their batteries at noon and start again at 1:30. They made four trips a day where the horses had only been making two. That is one of the points in the delivery question. In driving along with a horse on a level it is hard for a machine to make much better time unless it comes to a long jump, but when it comes to the hill work and coming down we are able really to accomplish more in Kansas City than we would be in cities that were more level. The service on the horses was so much severer that they could not stand it.

Mr. G. A. McDougald: How many miles on one charge would those cars go; how far would they travel and what speed would they make?

Mr. A. C. Downing: The car made 35 miles at a speed of 11½ miles with a load and they make about 12½ miles empty. The way they were working it they were making only about 24 or 25 miles on one battery. We found in experimenting that the mileage they wanted was just a little bit more than one battery would accomplish.

Mr. F. T. Kitt: I would like to ask Mr. Downing or anybody that has had experience with four-wheel drive as to the advantages of that, if there are any?

Mr. A. C. Downing: There are two, the couple gear and the Auto-rapid transit, formerly of Detroit, but they are out of business. The current consumption is very low. The very fact of its having driving traction at each wheel necessarily brings about a greater mileage, but they have their drawbacks that I think are greater than the increased mileage would be of benefit. I would like to see the couple gear people sell a number of trucks. The fact that you have a special motor in the wheel getting shocks directly is bad. It is bad enough for the motor to have to stand it when it has the protection of the springs. In St. Louis they had the trouble with their armature shaft springing. The wheel has a sort of a bore-pinion arrangement. Then a little pinion around the armature set, and as the armature turns that pulls the pinion and pulls the wheel around; and if they get a shock or jar you spring that shaft enough to allow the gears to jump and cause great inconvenience to the people who own the truck. It may be that in their later designs they have been able to overcome that.

The Chairman: Mr. Lamme, perhaps you can tell us some of the advantages and disadvantages of mounting the motors in these two ways, with spring suspension and without spring suspension?

Mr. W. F. Lamme: I have had little experience along this line. In some few large equipments we have spring suspensions. The New York, New Haven & Hartford Railway had the spring suspension motors of that type and there did not seem to be any trouble with them. For automobile work, though, I think we ought to get as near simplicity as we can. They have some advantages, as there is no doubt economy of current. That is not because of suspension but because the motors used have certain parts that give an advantage in the way of current. For truck purposes I believe the solution of the question is going to be in the use of one motor, one large motor. If by some means we can get a drive to the wheels this will give us the best result in the way of economy. This is plain because with one motor we can get better efficiency than with two or three or four; that is, for the weight, and all this tends

to economy. I think this will be the final solution of the question—one large motor built very efficiently will give you all the torque you want for all the conditions prevailing. That is all I have to say.

Mr. A. C. Downing: The General Vehicle Company are using that type of construction—one motor—but there is a question in the minds of the engineers as to whether they would rather have another motor to work with than a differential. The efficiency I think of the two would be about the same when it comes to the transmission of power or the loss of transmission, rather, and we know what a motor will do, and there is still some experimental work to be done on the differential, particularly on the counter shaft, to get them as reliable as the motor would be.

Mr. A. C. Jones: It seems to me that if there was no trouble entailed in transmission by the use of more than one motor you would be able to operate at a great deal higher efficiency on account of the fact that on light loads you would have the advantage of operating small motors at full load. Whereas, if you had one large motor under light conditions you would be operating under far less than high efficiency. So it seems to me that two motors would be better, provided the transmission system could be simplified.

Mr. A. C. Downing: I do not quite get your point. Suppose you had four motors, would not their aggregate capacity be the same as one motor?

Mr. A. G. Jones: It seems to me that if there was no trouble and say you got a five-ton truck and you only had one ton on that truck; you would be operating that motor far below its normal capacity and of course the efficiency would be a great deal lower on the lower part of the load curve than it would be if operating at normal capacity; on the other hand, if you had two motors or four motors, would it not be possible to use the two smaller motors on light load operating at nearly full load, cutting out the others?

Mr. C. T. Ryland: I think the application of the electric circuit to cut out the other two motors would overbalance the advantage. The advantage of the larger motor is that the motor itself is more efficient; but the disadvantage of the single motor is that the gearing from the motor to the drive wheels is more inefficient; so that if you had a motor on each wheel, while you are losing efficiency on each motor, you are gaining in effciency by cuttng out gear and shaft and belt, which is a source of annoyance greater than the two bearings and a pair of brushes on the motor.

Mr. G. A. McDougald: It is customary now to use gears with either one motor or two. With one motor the up-keep and trouble is reduced.

Mr. A. C. Downing: There is one more feature in using a single motor, particularly on large vehicles, when it comes to the designing and clearance available under the single motor; it would have to be of such dimensions and the platform to carry it and give clearance would have to be so high, a concern with trucking to do would not entertain the purchase of trucks for that reason. There are objections even with the smaller motors where we have the body only a few inches from the ground, and particularly on the Coast they are used to the drop axles and goose-neck wagons, and it would make it a harder proposition with a single motor.

Mr. C. T. Ryland: Of course the size of the motor depends upon the relative speed of the armature and field. Might it not be possible to get up a motor in which the field would rotate in one direction and the armature in the other, and in that way double the speed, and consequently obtain a smaller and lighter motor of greater efficiency; because if we run a motor at 600 revolutions it is not as efficient and it is heavier than a motor running at 1200 revolutions. The only obstacle is in leading the current into the brushes which would be rotating, if we rotated the field.

Mr. W. F. Lamme: That is the same old question—what speed is your motor running at? When you run your field at 800 revolutions and you run your motor at 800 revolutions, you are running at 1600 revolutions. The speed of a motor is fixed largely by the speed of the alternations, or alternations that we experience in commutating. That is one of the great difficulties, and that is one of the limitations. I think that trouble would be just as great if we used a high speed motor.

Mr. A. G. Jones: I would like to ask Mr. Lamme about the efficiency that Mr. Alvord was speaking of in the shunt motor and the series motor. Is not the characteristic very similar, the characteristic efficiency curve?

Mr. W. F. Lamme: They are somewhat alike. In a series motor the armature conditions are in the shunt motor, but the field conditions are different. One is constant and the other is variable. This makes the difference. The shunt motor generally has a longer, smoother efficiency curve, that runs out straighter on the heavy load, while the series motor comes down somewhat at the outer end. This is due to the copper losses in the field. The copper losses in the field of a series motor go up with the current. In the shunt motor they do not vary to a great extent. This is the chief difference.

Mr. G. A. McDougald: I would like to ask what the difference in efficiency is between a five-horsepower motor and two 2½-horsepower motors.

Mr. C. T. Ryland: We have a single motor operating by storage batteries, and we either have to throw out cells, put in resistance or do something of that kind in running slow. In street car practice you put the motors to start with in series and afterwards in parallel. Now, if we have two motors or four motors—two probably would be better—would it not be better to have a series parallel controller and in that way work our batteries at higher efficiency?

Mr. W. F. Lamme: In many cases we take the batteries and on the low speed we run them in parallel and on the high speed in series. We do that with great refinement and we get fully as good results or even better, for in the automobile we can interconnect our field and armatures and batteries so that we never need any resistance at all and get pretty good results. When we use no resistance we get our maximum efficiency.

The Chairman: The beauty of that scheme is, when we divide the battery into two or three or four parts, with every division we multiply the amount of current available, so that we can increase the torque without increasing the number of cells.

Mr. F. W. Pfaffman: Would that not unbalance the battery, drawing upon them unequally?

The Chairman: If the resistance of all the circuits are alike and the connections are good the discharge should be very nearly equal. Furthermore, suppose one set of batteries has discharged a little more than the other, its voltage would be lower and hence it would do a little less work and the other would catch up to it. If these trucks are taken care of in a garage intelligently, there is no reason why they should get out of balance permanently. I know that question has received a great deal of attention in connection with pleasure vehicles. Formerly that method of control was used. Now, the cells are operated all in series. Probably one of the reasons for that is that a great many pleasure vehicles are taken care of by the owners, and they would give absolutely no attention to the relative condition of the different cells.

Mr. C. T. Ryland: How are pleasure vehicles controlled?

Mr. F. W. Pfaffman: On the old Columbia, the first electric automobile, there were four sets of batteries which were connected, four in multiple, on the first notch, the second notch doubled the voltage and the third doubled the voltage again by connecting them all in series. On some of the modern cars they have two sets of batteries, one in front and one in back, half in each compartment. On the normal speed they run them in parallel. The first speed throws a small resistance in series; the second notch of the control cuts the resistance out; that is the normal running speed; and they have an emergency speed by throwing all the batteries in series, without any resistance in circuit.

Mr. G. A. McDougald: I will ask Mr. Downing how the electric truck is controlled.

Mr. A. C. Downing: The battery is divided of course. For the first and second speed the battery is in parallel; for the third and fourth speed they are in series; and then the connection of the field in series on the first notch and parallel on the second, and again on the third, and parallel on the fourth. Your batteries, of course, being divided, the first and second being the same and the third and fourth being the same.

The Chairman: The two most interesting points brought out are as to the results obtained regarding the relative expense of horse-drawn and electric trucks. That seems to be convincing. And in addition to that, the hill-climbing ability of the electric truck. For instance, in Kansas City the electric truck has been more successful in replacing horse-drawn vehicles than in cities having level streets. That would seem to be interesting to San Franciscans.

DISCUSSION ON "THE ELECTRIC PLEASURE VEHICLE."

Mr. W. D. Vance: One of the principal obstacles in the sale of pleasure vehicles is the promise that the newspapers are continually putting forward of a 200-mile battery within the next six months. Another is the high price of the first-class electric pleasure vehicle. People have not been educated to the point where they realize that the electric pleasure vehicle is a practical machine. The ordinary person regards it more as a woman's plaything than anything else; and I think if we are going to form a permanent organization here one of the main ideas should be to distribute, for instance, the minutes of this meeting or other educational matter that we might get together, broadcast to people that might be interested in the subject. They are all afraid to tackle the proposition because the electric vehicles that were gotten out a few years ago we all know were a failure and people have to be enlightened on the subject and shown that the electric vehicle of today is a success in every way with regard to economy of operation.

Mr. G. A. McDougald: The principal objection that I have heard about electric cars is in regard to the hills. If it can be impressed on the public mind that an electric car can climb a

hill I think we will have taken a long step forward. Most everybody says they cannot climb a hill, and they do not know whether they can climb a hill or not.

Mr. A. C. Downing: In reply to Mr. Vance: The impression the public have of the electric vehicle is purely a matter of education as you say, and it is a local education. Just 400 miles from here, at Los Angeles and Pasadena, there are more electric machines in operation per capita than almost any locality in the United States, which means, first, that their local conditions were favorable. The introduction of the electric automobile in cities where the conditions are adverse is merely up to some firm or number of firms in putting the subject in a proper light before the people. That is clearly shown in Pittsburg. Some number of years ago a man by the name of Brown—he is now down at Los Angeles handling the Baker—had a demonstrating car. He rode around the streets all the time. People noticed him; he had a sign on the side of the car; and he made it a point to work the hills. He sold one car in about five months. The firm back of him conceived the idea that somebody would have to break the ice; and as a result the first year he sold 18 cars in Pittsburg. Of course, that is very few for the population. The next year he sold 35 machines. That opened the eyes of his competitors, or in particular the gasoline men, and they commenced looking up electric agencies. The next year Mr. Brown sold 50 cars and a competitor sold about 150. He was the one that was the pioneer and did the missionary work; he led the way for the others. That is the same thing that must be done in San Francisco. We must all pull for the electric automobiles. It will do the work over these hills. Of course, we cannot go straight up California street every day. If a person wanted to get out Pacific avenue or Jackson street or some of those districts, he can run out Golden Gate and up Fillmore and only have three or four squares of steep grades to negotiate. The same would be true coming back; there are ways around. You find that true because in grading the streets they have figured on that to a greater or less extent. For instance, in Seattle the grade of Queen Ann Hill necessitated their constructing a road of less grade up that hill. There is for the street cars what they call the counterbalance going straight up; but none of the vehicles use that counterbalance hill for driving. So that these conditions are never so severe but what the electric automobiles will cope with them; and it is merely up to us and those interested in the electric automobile business to camp on the trail, demonstrating, talking, and letting time prove our statements. As to the publicity, there is not the field for the notoriety work that there is in the gasoline car, because our mileage radius limits and cuts out the possibilities for touring and harem-scarum conceptions of some riders' minds; so that it will have to be money expended in manners peculiar to each man's business. The Studebaker Company—not wishing to be personal in the matter or applying to them particularly, but as one of the factories in the East who have conceived that idea—wanted me to come out here and do missionary work. It is pretty hard for a fellow who has been selling cars every year in numbers to come to a field where there are not many sold, but still somebody must do it, and I hope to accomplish results and bring this about by mixing with the people and with the trade, helping them with what I know and gaining information from them. The control of statements regarding the car is something that is impossible, but we want to try to be as truthful regarding the capacity and ability of the car as we can, and gain the confidence of the people.

Mr. F. W. Pfaffman: In regard to the remarks of Mr. Downing concerning Los Angeles and Pasadena and the popularity of the electrics in those regions, I would say that aside from the favorable climatic conditions, the presence of electrics down there is due to the men who have introduced them. For instance, Mr. Braley of Pasadena I believe had no encouragement whatever, but he simply went in and sold the machine. He is is the kind of man that the public would have confidence in; they would accept his statement. He told me that he sold 96 cars the first year.

Mr. W. N. Stevenson: Four years ago last month there were 43 in use, and all through Southern California Mr. Braley has placed 500 cars. The people take very much to the idea of an electric runabout for pleasure work in that part of the country. We have cars there—one five years old—just as nice cars as the new cars; not quite as stylish as the new cars, but they have been operating for that length of time. There does not seem to be much objection to the electrics. We have a 27 per cent grade, and if any one has a doubt about their hill-climbing ability, we can demonstrate it to them right there.

Mr. I. G. Perrin: In connection with what Mr. Downing said, I think a great deal might be accomplished by an organization of electric automobile dealers in starting and promoting a sort of publicity bureau, to set forth the facts as they are, being very careful not to overstate or exaggerate on the possibilities of the electric car. If a publicity bureau were started in that respect so that the public might have a reliable means of learning what the electric car was and what it can do and also the expense of operation, I think such a thing as that might accomplish a great deal to further the interest of the electric automobiles, particularly in these parts where it is more or less new and there is a question in the minds of the public whether or not it is thoroughly practical in every way.

Mr. F. W. Pfaffman: Just one point, that is, that a large percentage of the prospective customers do not make up their minds as quickly as a man purchasing a gas car. All of the agencies should take care not to create a doubt in the mind of that particular purchaser or prospective customer as to the practicability of an electric vehicle. We should all try to boost and not be knockers. You can very readily spoil the sale of an electric vehicle by creating a doubt in a purchaser's mind as to whether a car is a success or not. A person can very justly say: "This man said so-and-so derogatory of that man's car." The other man comes along and says likewise of that car. That has created a suspicion in that person's mind and many times they have given up the idea of purchasing an electric and bought a gasoline. We should not try to bring out the bad points of the electric, and we should not try to sell our car by knocking the other car.

Mr. A. C. Downing: On the tire question. The question of a special tire for the electric automobile is one that a good many manufacturers avoided as long as they possibly could; in fact, the first tire for that type was not developed sufficiently to give any sort of mileage, and naturally it was a source of annoyance and cost to the owner of the electric automobile. The person who purchased an electric automobile did so thinking that he was buying a simple piece of machinery free from trouble. The minute the wife or daughter or owner himself would go out on the street and have a blow-out his utterances and feelings toward the electric machine would not be fit for print, so that the tires used were all of the slow type to a greater or less extent. Some of the concerns took up the matter, appreciating the increased mileage and speed they were able to obtain and advertised a car trying to convey the idea that the advantage was in their particular car alone and due to some perfected appliance that they were able to use. That reacted on them after a while when some of the other manufacturers came out with the same equipment. But there is no question but what the tire that we have today means a great deal to the electric automobiles. For instance, say the vehicle was equipped with the standard road tire such as used on the gasoline car, making a speed of 15½ miles an hour, the draw, with two passengers and top up, being in the neighborhood of 40 amperes, that is, 60 volts, the same load under same conditions, merely changing the tires to the special electric type, would reduce that ampere draw to 33 to 34, and give a speed of 18½ to 19 miles an hour, thus making a difference of approximately 75 per cent.

The Chairman: Seventy-five per cent in mileage?

Mr. A. C. Downing: In speed and mileage. Of course, that is with a tire that will give approximately three to four thousand miles if it is properly enveloped and in operation. The manufacturers today are using them universally, and it has brought about the possibility of the larger mileage radius, more efficient working upon the part of the motor, and economical discharge rate for the battery.

Mr. A. H. Halloran: What are the particular differences between the electric tire and the gasoline?

Mr. A. C. Downing: The only difference is that the electric tire is lighter, constructed by what they call the thread construction, and it is more resilient. For comparison, take two rubber balls the same size, one of them hollow and of light rubber, and the other of solid rubber and let them drop. Your light rubber ball will come back to your hand and your heavy rubber ball will not rebound so high. It is a question of resiliency; and the life of the tire of the special electric type is necessarily shorter than the heavy car type, but we are willing to sacrifice that in order to get the other results.

Mr. G. R. Murphy: I would like to know if there are any figures published of the necessary tractive effort at different speeds with different tires and different vehicles; in other words, taking a heavy truck, could you give us at different speed the necessary tractive effort in pounds per ton in the same way that it can be obtained for interurban or street railway work? We are always compelled to resort to the manufacturer's specifications or catalogue of mileage. If we could get data like that in the form of a curve I think it would be very important, as in case of trouble it would be easy to satisfy a customer complaining of poor mileage by placing the trouble where it really exists.

The Chairman: It would be quite possible, if we always had the same road, to make tests on tires and say that the tractive effort required per ton would be a certain amount, but the difference in the character of the roads makes it very difficult to make a statement of that sort. These tests of Mr. Pfaffman show that at a speed of 15 miles an hour, the same vehicle, on same road and everything, will give a mileage of 60 with the ordinary Diamond tire; with the Motz road tire it is practically the same; with the Morgan & Wright special tire it is about 93;

and with the Palmer special tire it is 100, showing that by simply a change in tire the mileage is increased somewhere about 80 to 90 per cent. That would show that the tire problem is an extremely important one; not only does it increase the radius of action, but it increases the number of miles that the vehicle would do on one battery, that is, you can do 90 per cent more on one battery. It reduces battery renewals by nearly 90 per cent.

The Chairman: We have a gentleman with us here who has given considerable study to advertising. I will ask Mr. Pfaffman if he will give us now his ideas on advertising the pleasure vehicle.

Mr. F. W. Pfaffman: The best advertising, of course, is to put prospective purchasers into your machine and demonstrate its advantages, the speed and general road qualities of the particular machine that you want to sell. But in order to attract the attention of parties who are wholly disinterested, I have made a few experiments and am going to make some more. I have been rather successful in attracting attention to my machine. My method consists principally of getting acquainted with newspaper men and submitting to them photographs of the machine that are in an interesting attitude and also containing prominent, well-known people. I know there is very little objection on the part of people to being photographed in a machine and even to gaining their consent to have the photograph published. It does not require much urging, and the newspapers are very glad to have such illustrations for their Sunday magazines and at very small cost, that is, if you give them a very small advertising contract. That is all in proportion to one's means. Otherwise, there is the mailing of specially gotten up postal cards, to people who might possibly be interested, people of means and people you think would find considerable use for them. It is simply a matter of selecting beautiful spots and locations and having a neat photograph taken at a very small cost—postal cards made up and mailed to such men generally and regularly, say by kind of follow-up system. It is done weekly at an expense of not exceeding ten or fifteen dollars. If you have only 100 on your mailing list, it will not exceed five dollars a week. So many opportunities present themselves for interesting the public, just little everyday occurrences, if you will think them up and put them on paper. I have not so much confidence in verbal descriptions as I have in pictorial effects. Words do not seem to convey the idea so well. Furthermore, people are so abundantly supplied with literature that they cannot give them the time, but they cannot get away from a picture. Besides the other methods of advertising—we might call it advertising—is associating with people who have lots of friends and acquaintances and suggest names. I believe it is a good idea to cover the demonstration car with signs whenever you have not anybody in it that is receiving a demonstration. As far as I am concerned I ride in my car with signs from top to bottom without any embarrassment, but a prospective purchaser will not do that, especially a lady or person with means. They object to being made an object of inspection on the street. It is possible to have the signs so that you can take them off. I do not believe that kind of publicity hurts a machine, even if it is a high-priced machine, if it is used only at the proper time. Also, electric illumination signs at night, at the prominent cafes and theatres, and these signs can tell a little story that might catch the fancy; glass signs nicely made up with lamps back of them in a metal case; illuminated signs illuminated by the battery which can be read for a block. I believe the proportion of expense as compared with newspaper advertising is very small, in fact, there is no comparison, and people cannot help but notice it.

Mr. F. T. Kitt: I would like to ask Mr. Pfaffman what he means by illuminated signs exhibited at the cafes?

Mr. F. W. Pfaffman: I put up four signs in my car, one under each step and one in front and one in the rear. I put them under the shafting. The signs on the front are probably 7 by 30, the rear signs 7 by 30. The metal case I attached to the bottom of the shafting. The metal case in front contains four lamps, five lamps in the rear and two lamps below the steps. When the car went down the street with all that light on it, it gave me what I think would be $50 worth in a newspaper.

DISCUSSION ON "THE ELECTRIC GARAGE."

The Chairman: Mr. Reed has been busy exhibiting in San Jose the past week, and he was rather late in getting his thoughts on paper, but his paper shows mature thought and experience. This matter is open for discussion.

Mr. R. M. Alvord: Mr. Reed mentioned the gas engine generator set for the garage. I would like to ask if he has had any definite experience in mind or can give us an account of any in that connection. I remember when I came out here about two years ago the Southern Pacific Company had just changed their signal service over from a gasoline generating plant by which they charged their batteries for the signal service to the converter system; they used a rectifier; and I have been advised that they saved considerable money thereby, in maintenance and up-keep of the batteries—considerable in labor in the first place and also in the maintenance of the apparatus.

Mr. S. P. Reed: My authority in regard to the gasoline generating plant was principally the reading of the experience of one garage, where they generated their current, and they figured the cost at 2 cents. The improvements of the gas engine I think are another matter that we have to consider; you have to become familiar with the little things that go to make it run right. It will hold its own very well with the modern methods, using a storage battery and electric devices, but of course it is not the best—no doubt of that. We simply use the gas engine generating plant where we cannot get satisfactory arrangements with the local power company.

Mr. C. T. Ryland: I have had a little experience with a gasoline engine for electric lighting purposes. When we first started up in Sonoma, about ten years ago, we had a 38-horsepower, indicated, Otto gas engine, to run an electric plant to supply the town with light. You know what a hit or miss proposition that is, with a single governor. But we succeeded in getting a steady light just the same. But the price of gasoline kept climbing and we used distillate; then the price of distillate kept climbing, and we finally used crude oil. We used the crude oil by burning the exhaust through a cylinder and got the gas out of the oil and we used the gas in the Otto engine. Our cost was less than one cent, so far as oil was concerned; but the attendance made it run up pretty high. The gross income of that plant was $150, and they made a reasonable amount of money; they did not make a fortune.

Mr. I. G. Perrin: I would like very much indeed to have an expression from somebody who has had experience with a modern generating outfit. I have had no experience myself at all, but even at the very reasonable price which we get in Oakland I think, where the garages are using in the neighborhood of $125 to $150 worth of current at 3 to 3½ cents, with a modern generating outfit they ought to be able to cut that expense down some. If there is anybody here who has had experience with a modern generating outfit, I would be glad to hear from him.

Mr. A. H. Halloran: Following the experience of the smaller operators all over the country, for instance, in lighting buildings, the isolated plant as a rule cannot compete with the central station, particularly in large cities. In figuring on the initial installaton and the cost you may figure on ideal conditions while unexpected conditions will come up in connection with the operation of the plant, and it will be found more satisfactory on the whole to rely on the central station if there is a central station established. They are there for that purpose; naturally they make a profit; but furnishing current in large quantities they can give even the retail buyer a better price, and most certainly a better service than he can expect by himself.

The Chairman: The other day I wrote to all the central stations on the Coast and I have had replies as to the rates they make to garages. Those rates vary from 2 to 5 cents under different conditions. That shows that the central stations are willing to make the right rates. They are lower on the Coast than they are anywhere else in the United States. So that the question of rates that the central stations are making is a minor one. We are getting good rates, but the point we want to bring out is, that they should advertise the electric vehicle, having become convinced themselves that the electric vehicle is the proper thing.

Mr. Brand: There is an idea that came into my mind while Mr. Reed was in the early part of his paper. I would like to ask if the garage men have ever considered in connection with the individual garage of the vehicle user or owner—in the city there is a service maintained by certain individuals for caring for certain motors by monthly or perhaps weekly inspections, and they have a certain amount of customers on their routes, and it results in a very economical method of keeping the motors in condition. It occurred to me that the same thing might be applied to the automobiles. The salesmen, or company selling, for instance, could maintain these men or let individuals establish such a business for themselves, of making a weekly inspection of the garage or each of the machines. It is stated that the troubles that usually lead to disastrous results are generally minute and such as an expert could remove in their early stages very easily. I do not know whether that has ever been tried, making a route for weekly inspections.

Mr. W. D. Vance: It has been our experience when we sell a man a car who desires to take care of it himself, you must give him a promise that you will see that he has none of these troubles. In order to avoid those troubles, we have found it necessary in those cases about every two weeks to call and make a thorough inspection of the battery and motor. At the present time we are not making any charge for this, but in the future I presume that will be arranged and the owners will pay a nominal fee for that work.

The Chairman: The central stations should consider that

every electric vehicle coming into the town adds so much motor load to their system from 12 o'clock to 6 o'clock in the morning, owing to the interposition of the battery. Another subject we promised to bring up was the tungsten lamp for lighting purposes. I will ask Mr. Reed to speak to us on that subject.

Mr. S. P. Reed: We have been working on this tungsten lamp idea for nearly two years. We imported the first tungsten lamps on the Coast from Germany, and when I saw them and saw the fine filament I thought if they had only lower voltage we would have very good lamps. Immediately after when working with the storage battery I thought we ought to have the tungsten lamp with the storage battery. I asked a number of dealers what they were doing, after the tungsten lamps were manufactured in the United States, and to see if they could get me a low voltage tungsten lamp or see if they could get them manufactured. I went to all the houses here. They promised to do what they could. Shortly after a little slip came out saying that they were going to make these lamps. Finally I succeeded in getting some from the factory and tried them out. Some of them worked very well and some of them burned out in no time. But I found that the same firm was able to furnish a very durable lamp. We used the lamp in the automobile headlight, sidelight and taillight, and we have been running them for about six months. I guess they are the oldest lamps in operation. There seems to be a great variation in the lamps. Some of them blacken a little and others will burn out, but on an average they run very well. The up-keep cost of the lamp on the whole is very small. The first ones we put on were for the side and the taillights. They were very successful. I was afraid to tackle the front lights on account of the amount of current being too large for an ordinary battery. These sidelights were so successful that I put on headlights. I went to work to find out if there was any method by which we could use them for the headlights. I had some reflectors made, the same reflector that is used on the ordinary street car for an incandescent light. They turned out very well. The difficulty that I have now is that the light is not perfectly smooth, but I found that I was more sensitive than the owner of the car. When I threw it on a current I could see that the light was irregular, and I could not overcome that; I presume on account of the shape of the filament. But when I started to put these on the cars the first was on that of a doctor in San Jose; he was very well satisfied. He came around and took me out and showed me what he could see; he said he could see a greater distance than with the acetylene light. First I had only an eight-candlepower lamp. I changed these to 12 in his car and he put in a 60 ampere battery, using it for his ignition, his headlights and taillights and sparker. Every week I told him I did not know how long his battery would run; I did not know the way he was operating his car. Every week he came in, and he ran five weeks. We generally recommend a recharge of the battery every month. He was very enthusiastic and soon brought in several others to put on these headlights. I think they are going to take very well. We demonstrated them at the San Jose show, putting out the other lights, showing that we could cast a searchlight about the room. We showed that they were clean and could be operated with ease and no risk of fire.

ENGINEERS OF WISCONSIN FORM STATE SOCIETY.

The organization of the Engineering Society of Wisconsin was completed at the first meeting, held at the University of Wisconsin February 24th, 25th and 26th, at which some 150 city engineers, general managers of power and traction companies, contracting engineers, superintendents of water and light plants, mechanical and civil engineers, and superintendents of highway construction were present and became charter members.

The officers elected were: President, Dean F. E. Turneaure, University of Wisconsin College of Engineering; Vice-President, City Engineer McClelland Dodge of Appleton; Trustees for two years, B. F. Lyons, assistant general manager of the Beloit Gas and Electric Company, and E. P. Worden, mechanical engineer of the Prescott Steamp Pump Company, Milwaukee; and Trustees for one year, E. Gonzenbach of the Sheboygan Electric Light and Power Company, and City Engineer E. R. Banks of Superior. These, as Executive Board, will elect the Secretary later.

The new organization will hold annual meetings hereafter for the purpose of bringing together the engineers from all parts of the State interested in the solution of such problems as arise in connection with municipal plants, large construction work, bridge, forest and water power questions, and light and power production. A wide range of subjects was included in the program for the initial meeting of the society.

At the opening session, February 24th, following the address of welcome by President Charles R. Van Hise, was a presentation of the scope of the highway work of the State Geological Survey, by W. O. Hotchkiss, highway engineer of the survey. A. R. Hirst, also of the State Highway Department, spoke on the use of tar, oils and emulsions on macadam and earth roads. The discussion on pavements was led by McClelland Dodge, City Engineer of Appleton, and participated in by P. H. Connolly, City Engineer of Racine, W. G. Kirchoffer, Consulting Engineer, Madison, and others. City Engineer C. V. Kerch of Janesville spoke on the construction of the Court-street bridge in that city.

Interest in the discussion of the conservation of forests and water resources of Wisconsin, a subject presented by State Forester E. M. Griffith, waxed so keen that the paper on the water power resources of the State, by Prof. L. S. Smith, who is engineer for both the State and National Geological Surveys, was postponed to the following evening. The conservation discussion was led by Senator T. W. Brazeau, and Senator E. E. Brown, Assemblyman J. R. Jones and Prof. D. W. Mead also spoke on the subject.

Prof. W. D. Pence, who is engineer for the Wisconsin Railroad Commission, opened the second day's program with a description of the organization of the Commission's engineering staff. The new problem of standard of gas and electric service was discussed by Prof. C. F. Burgess of the Department of Applied Electro-Chemistry at the University, who has done important work in enabling the State Railroad Commission to prescribe a standard for fuel and illuminating gas.

The electric interurban roads of Wisconsin were made the subject of an address by F. G. Simmons, superintendent of construction and maintenance of way for the Milwaukee Electric Railway and Light Company. The day circuit for small towns was discussed by Prof. J. W. Shuster, and new forms of arc lamps by W. E. Wickenden, also of the Electrical Engineering Department. Dean Turneaure took the members of the society through the engineering experimental laboratories, explaining the work that is being done there in many lines of research.

The second night was given to a discussion of water powers, W. G. Kirchoffer describing the water supply of the city of Marshfield, and Professor D. W. Mead the subject of hydraulic and hydro-electric power development. Papers on the water-proofing of concrete, by F. M. McCullogh, City Engineer of Stoughton; municipal engineering in the Orient and in Porto Rico, by J. T. Hurd and Edwin Wray; gas producers and small power stations, by V. E. McMullen, Beloit, and C. T. Atkinson; and Madison's concrete storm sewer system, by City Engineer John F. Icke, concluded the convention program.

The electric vehicle, says the Electrical Review and Western Electrician, is essentially the proper equipment for shopping trips; for the doctor who must depend upon a machine to be in readiness day or night, and which he can manipulate himself without fuss or bother and without calling upon a professional driver. The noiselessness and ease of control of the electric vehicle make it the perfect machine for ladies' use, and for threading in and out the busy city traffic the business man for his short trips finds it an especially agreeable mode of travel.

Long-distance wireless telegraphy enabled the Nippon Yusen Taksha steamship Aki Maru to make the 4,240-mile trip from Yokohama to Seattle without being out of communication with either shore. Other vessels of the same line acted as relay stations when direct communication could not be held.

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News Notes 220

The McCall's Ferry generators weigh three hundred thousand pounds, not three hundred million as stated in our issue of March 6, 1909.

The final settlement of the Kellogg case, as described elsewhere, is hailed as a great victory among Independent telephone manufacturers.

The latest census figures on the telephone show the great strength of the Independent movement in the Middle West, but do not indicate the rapid growth that the same movement is making on the Pacific Coast. Arrangements have been made whereby descriptions of some of these new installations will soon appear in these columns.

The California Legislature has passed a law requiring a telephone company to complete its plant within three years after grant of franchise; to pay an income tax of two and one-half per cent. and entailing certain restrictions on pole lines. Companies doing interstate business are exempt from this local legislation.

Civilization By Telephone

Printing is credited with having aided the advancement of civilization more than any other single factor. Books embody the ideas of one man so that many may know. The man's efficiency is thus multiplied many times. The same result is accomplished by the telephone, on a smaller scale perhaps; one not likely to displace books, but one that is constantly gaining ground.

A telephone line is almost completed across Afghanistan between the frontiers of India and Persia; the interior of what what was recently "darkest Africa" now has its telephone; and the American Indians talk to others of their tribe by its means. "Though I take the wings of the morning and fly to the furthermost parts of the sea," still can I be reached by the wireless telephone or telegraph. Geographically, non-intercommunicability will soon be a thing of the past.

The telephone has invaded the secret precincts of the harem and the underground recesses of the safe deposit vault. Its insistent ring interrupts the gravest deliberations with the most trivial message. It is found in the wilderness, mayhap that a railroad president on a hunting trip may know what is happening to his stocks. The mine secretary in a city sky-scraper may talk with the superintendent at the bottom of the mine.

In European cities the telephone service informs its subscribers of the news of the day and entertains them with opera or cafe music. Lectures and sermons are transmitted to those unable to attend the meeting. Court testimony is taken and cases tried over the telephone, and there is a record of a marriage ceremony performed in this manner. By its use the farmer is in close touch with the market and can hold his produce for favorable prices, be warned of the weather, and always be in close touch with his neighbor in case of fire, danger or sickness. Space and time are annihiliated in every walk of life as the telephone comes more and more into use.

A number of isolated individuals are closely bound by the telephone into political and social organization. With the multiplication of the means of culture and enjoyment, progress and achievement, the telephone to-day seems to be one of the most active civilizing influences at work.

PERSONALS.

S. K. Colby, treasurer of Pierson, Roeding & Co., of San Francisco, is on a short trip East.

F. W. Wachter, manager of the Empire Construction Company, left last week for Los Angeles.

John W. McDowell, representing the Manhattan Electrical Supply Company, New York, spent a few days in San Francisco during the past week on his annual Pacific Coast trip for his company.

Jonathan Camp, of the Franklin Electric Manufacturing Company, Hartford, Conn., manufacturers of the Femco lamps, is in San Francisco, after spending about two weeks in Southern California.

A. T. Clark, treasurer of the American Circular Loom Company, Boston, Mass., has been spending a week in San Francisco, devoted partly to business and partly to pleasure. From San Francisco he will go to Los Angeles, and during his stay there spend a few days fishing at Catalina Island.

TRADE NOTES.

B. F. Kierluff Jr. & Co. of Los Angeles reports orders for cedar poles from the Los Angeles Gas and Electric Company, the Los Angeles Aqueduct, Redlands Home Gas and Electric Company, Downey Heat, Light and Power Company, Ontario Power Company, Colton Municipal Lighting Plant, Pioche Light and Power Company, and the Pasadena Municipal Lighting Plant.

TRADE CATALOGUES.

Bulletin No. 110 from the Electric Storage Battery Company illustrates and describes the operation of chloride accumulators in connection with remote control oil switches. Bulletin No. 112 shows the application of the chloride accumulator to the requirements of iron and steel mills.

The Kellogg case, that of Dunbar et al. vs. the American Telephone & Telegraph Company, started nearly six years ago, has been decided in favor of the plaintiffs and ownership of the Kellogg Switchboard & Supply Company restored to Milo G. Kellogg and associates. This decision of the Supreme Court of Illinois again puts the Kellogg company in the ranks of the independent telephone manufacturers.

Bakelite is a coal-tar derivative said to possess the properties of rubber, celluloid and amber, and of use as an impregnating insulator. Its properties were described in a paper read at the March meeting of the New York section of the American Electrochemical Society by Dr. L. H. Baikeland.

Underground telephone cables have been installed between London and Birmingham, 420 miles, which, joined with that between London and Bristol and Tavistock, gives a total length of 740 miles. The maintenance cost is one-eighth that of overhead lines.

A 110,000-volt transmission line has been authorized by the Hydro-Electric Power Commission of Ontario from Niagara Falls to St. Thomas and Toronto. Three-phase, alternating current, 25 cycles will be transmitted over 293 miles of line.

A telephone service meter is a counting machine that registers the number of calls to be charged against a subscriber being furnished a special kind of service. The call is registered by pressing a button.

JOVIANISM IN SOUTHERN CALIFORNIA.

The Sons of Jove in Southern California are setting a pace in organization work which suggests that the San Francisco Jovians may find it necessary to look to their laurels if they are to hold the lead in Jovian work on the Pacific Coast.

The Jovians of Los Angeles have recently organized with the following committee:

Jupiter, H. V. Carter, 858; Neptune, W. R. Greene, 990; Pluto, A. W. Ballard, 1304; Vulcan, A. L. Havens, 1630; Mercury, William G. Stearns, 1633; Hercules, C. G. Pyle, 1308; Mars, H. Conger Bowers, 1305; Apollo, C. H. Carter, 1625; Avrenim, N. W. Graham, 1629.

The first Rejuvenation under authority of the new committee took place at the Hollenbeck Hotel, Los Angeles, on the night of February 27th, and was a complete success from every standpoint.

The following new members were rejuvenated and elevated to the upper level:

Ralph Bissell Clapp, Calvin F. Baker, Charles H. Coulter, Oscar Ernest Thomas Jr., George Arthur Crooke, Will Carleton Caffray, Edward Warren Currier, Roland Harry Monahan, Charles Francis Hartung.

Following the rejuvenation the newly initiated members were entertained at a dinner, which is fully described in the following menu:

10,000 Test Menu

Cocktails
"Cyclops" Style
"B. Green" Sea Turtle
Olives Celery Radishes
Reisling
"a la Vulcan"
Catalina Sand Dabs "a la Fish"
Dinkey Pickles
Potatoes Parisienne
Lamb Chops "Apollo"
Green Peas
Jovian Punch
Zinfandel
"For all Foulkes"
Roast Squab
Chicken "Stuffed a la Ballard"
Browned Sweet Potatoes
Giblet Sauce
Crab en Mayonnaise
"Pyle-d" Strawberries
a la Carte
Assorted Cakes
"Graham" Wafers
Sierra Cheese
Cafe Noir

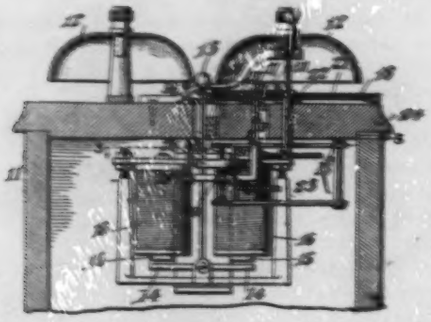
JOVIAN REJUVENATION
LOS ANGELES, CAL.
FEB. 27, 1909

The menu itself was unique, being printed upon a strip of armature cloth and enclosed in what was apparently a miniature dry battery cell.

All of the arrangements were carefully worked out and executed, and the success with which the rejuvenation was handled reflects great credit upon the committee.

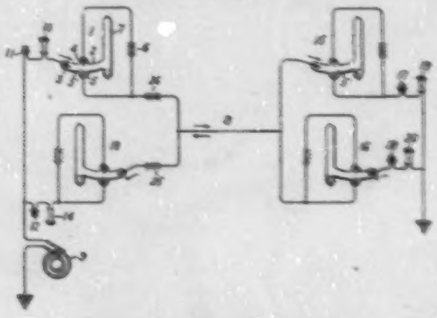
PATENTS

913,607. Telephone Call Mechanism. William E. Zabst, Portage, Wis. In a system of the character set forth, the combination with a signal member, of controlling means engaging with the signal member to hold the same from full operation but permitting it to be partially operated, a motor, holding means for the motor, means acting to withdraw the



holding means from engagement with the motor, and mechanism engaged with the holding means to prevent its releasing the motor, said mechanism being held in its engaged position by the signal member, but adapted to be released by a partial movement of the signal member, thus permitting the motor to actuate the controlling means and move it out of the way of the signal member.

913,521. Multiplex Telephony. Marius C. A. Latour, Paris, France, assignor to General Electric Company. In a system of telephony, a line conductor, means for impressing on said

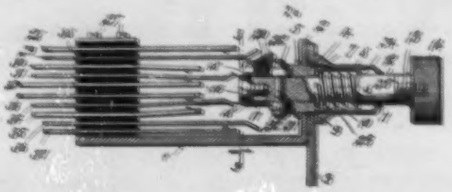


line conductor current pulsations of one polarity which succeed each other at regular intervals, means for superimposing on said current pulsations, fluctuations corresponding in frequency and magnitude to voice vibrations, means for utilizing said fluctuations to produce sound and independent means for transmitting current waves of opposite polarity to said line conductor.

912,778. Telephone-Cord Protector. Edward T. Banes, Philadelphia, Pa. The combination of a telephone jack plug, a flexible conductor cord attached to the jack, and a sleeve of soft rubber surrounding the cord at a point where the latter

enters the plug and arranged with its internal surface in frictional contact with the cord by the contractile tendency of the sleeve and secured to the jack to assist in retaining the sleeve in place.

913,080. Ringing-Key. Klas Weman, Buffalo, N. Y. In a ringing key for telephone switchboards, the combination with a longitudinally slotted tube having a lower serrated edge,

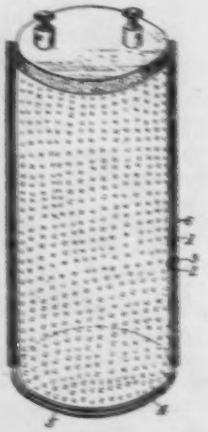


of a plunger provided with a transverse pin having projecting ends designed to travel in the slots in the tube, and a second pin carried by said plunger having rollers adapted to rest in the serrations in said tube.

912,701. Telephone Attachment. Arthur W. Lyda, Pittsburg, Pa., and Elmer C. Robinson, Lowellville, Ohio. A telephone attachment comprising a main member embodying an annulus or ring provided with an annular inwardly projecting

flange, a closure member hinged to the said annulus or ring, a face plate carried by said closure-member, a disinfectant pad carried by the closure member, and means common to the disinfectant pad and closure plate for securing them within the closure-member.

913,563. Method and Apparatus for Revivifying Dry-Cell Batteries. Horace B. Ramey, Alexandria, Va. The process of revivifying a dry battery, which consists in removing the wrapper from around the same and the sealing material from



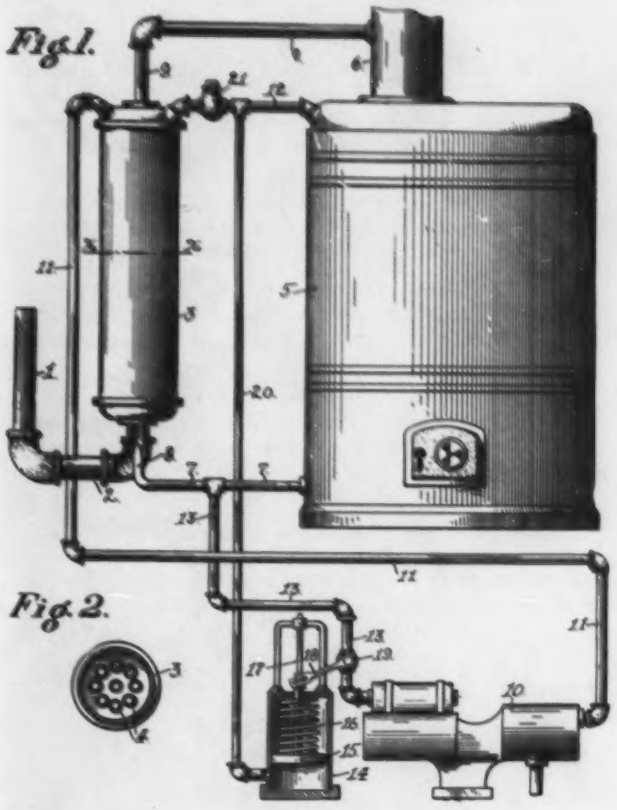
the top of the same, cleaning the external zinc surface and puncturing it with a number of holes, placing the cell thus prepared within a receptacle of imperviously coated absorbent material impregnated with an electrolyte, and pouring water into the top of the cell.

INDUSTRIAL

A NOVEL VACUUM CLEANER.

Of the many devices recently perfected for vacuum cleaning, one of the simplest and most effective is shown in the accompanying cut. Its advantages include cheapness in first cost, in operation and in maintenance, as well as excellent work, and sanitary. Dirt removal in this machine, there is nothing left after cleaning a building to dump in a sewer. The machine consumes it all and consequently is ready to move next door or anywhere and commence operations immediately.

The machine consists essentially of a flash boiler which supplies steam to an ejector so placed as to create a suction through a pipe connected with the usual form of suction



nozzle renovator. The dust is delivered through a heat interchanger where it is totally consumed before it reaches the top of the stack. This machine, which is the invention of Mr. C. Johnson, 121 Clement street, San Francisco, is in practical operation to-day.

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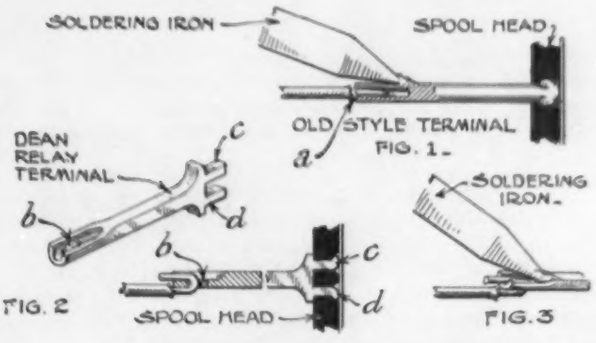

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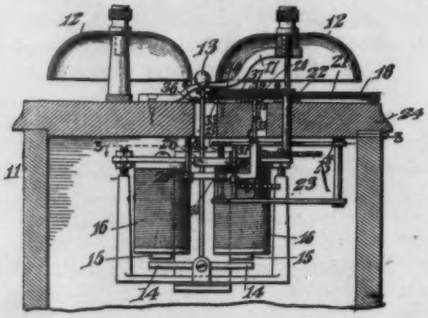
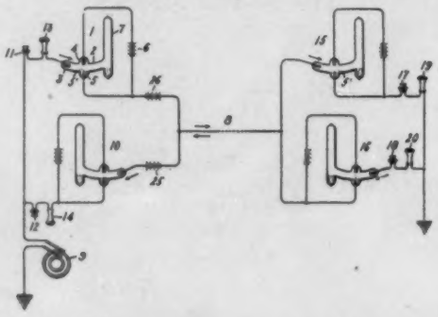
PATENTS

913,607. Telephone Call Mechanism. William E. Zabst, Portage, Wis. In a system of the character set forth, the combination with a signal member, of controlling means engaging with the signal member to hold the same from full operation but permitting it to be partially operated, a motor, holding means for the motor, means acting to withdraw the



holding means from engagement with the motor, and mechanism engaged with the holding means to prevent its releasing the motor, said mechanism being held in its engaged position by the signal member, but adapted to be released by a partial movement of the signal member, thus permitting the motor to actuate the controlling means and move it out of the way of the signal member.

913,521. Multiplex Telephony. Marius C. A. Latour, Paris, France, assignor to General Electric Company. In a system of telephony, a line conductor, means for impressing on said

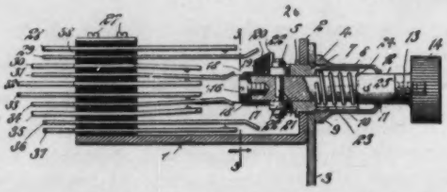


line conductor current pulsations of one polarity which succeed each other at regular intervals, means for superimposing on said current pulsations, fluctuations corresponding in frequency and magnitude to voice vibrations, means for utilizing said fluctuations to produce sound and independent means for transmitting current waves of opposite polarity to said line conductor.

912,778. Telephone-Cord Protector. Edward T. Banes, Philadelphia, Pa. The combination of a telephone jack plug, a flexible conductor cord attached to the jack, and a sleeve of soft rubber surrounding the cord at a point where the latter

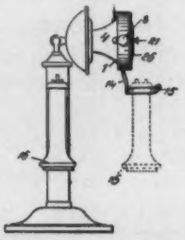
enters the plug and arranged with its internal surface in frictional contact with the cord by the contractile tendency of the sleeve and secured to the jack to assist in retaining the sleeve in place.

913,080. Ringing-Key. Klas Weman, Buffalo, N. Y. In a ringing key for telephone switchboards, the combination with a longitudinally slotted tube having a lower serrated edge,



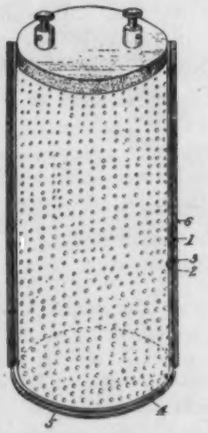
of a plunger provided with a transverse pin having projecting ends designed to travel in the slots in the tube, and a second pin carried by said plunger having rollers adapted to rest in the serrations in said tube.

912,701. Telephone Attachment. Arthur W. Lyda, Pittsburg, Pa., and Elmer C. Robinson, Lowellville, Ohio. A telephone attachment comprising a main member embodying an annulus or ring provided with an annular inwardly projecting



flange, a closure member hinged to the said annulus or ring, a face plate carried by said closure-member, a disinfectant pad carried by the closure member, and means common to the disinfectant pad and closure plate for securing them within the closure-member.

913,563. Method and Apparatus for Revivifying Dry-Cell Batteries. Horace B. Ramey,, Alexandria, Va. The process of revivifying a dry battery, which consists in removing the wrapper from around the same and the sealing material from



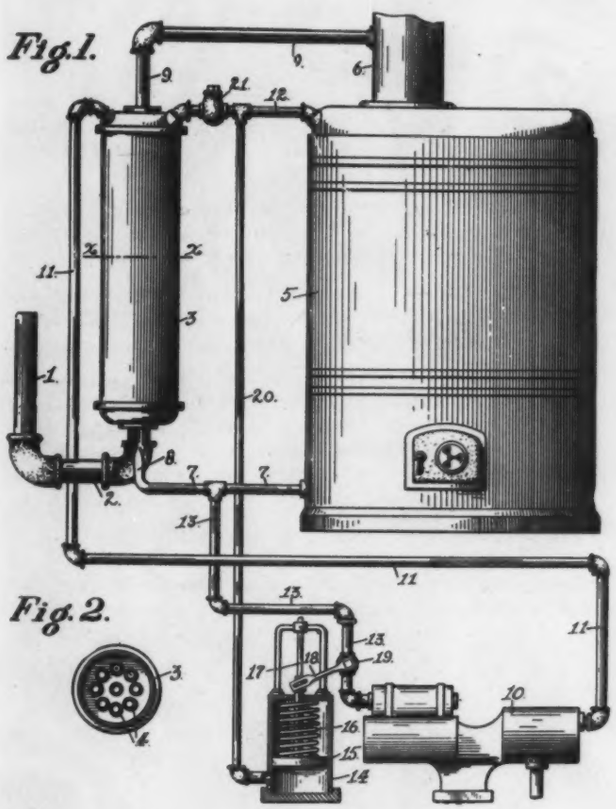
the top of the same, cleaning the external zinc surface and puncturing it with a number of holes, placing the cell thus prepared within a receptacle of imperviously coated absorbent material impregnated with an electrolyte, and pouring water into the top of the cell.

INDUSTRIAL

A NOVEL VACUUM CLEANER.

Of the many devices recently perfected for vacuum cleaning, one of the simplest and most effective is shown in the accompanying cut. Its advantages include cheapness in first cost, in operation and in maintenance, as well as excellent work, and sanitary. Dirt removal in this machine, there is nothing left after cleaning a building to dump in a sewer. The machine consumes it all and consequently is ready to move next door or anywhere and commence operations immediately.

The machine consists essentially of a flash boiler which supplies steam to an ejector so placed as to create a suction through a pipe connected with the usual form of suction



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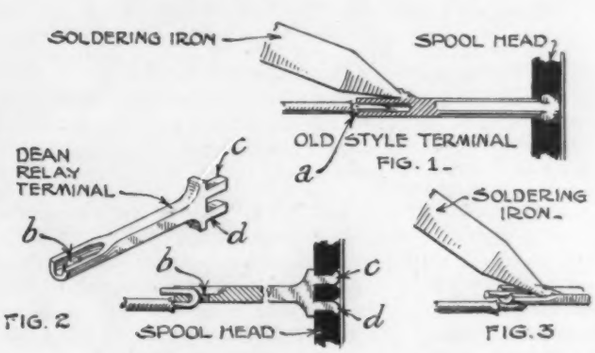

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NEWS NOTES

TELEPHONE.

ANACONDA, MONT.—A new section has been added to the Anaconda company switchboard.

SHERMAN, WASH.—The line of the Sherman Telephone Company is to be overhauled this year.

KENT, WASH.—A fine building is to be put up to house the Independent Telephone Company here.

GEROME, WASH.—D. M. Glasgow is president of the newly organized Southwest Telephone Company.

POCATELLO, IDA.—Thaddeus S. Lane, of Butte, has been granted a telephone franchise for this city.

SALEM, ORE.—Extensive improvements are contemplated in the system of the People's Telephone Company.

DUFUR, ORE.—A 30-year franchise for a telephone system has been granted to J. A. Stevens and W. Brigham.

SAN FRANCISCO, CAL.—The Home Telephone Company is having plans drawn for the erection of two more substations.

MT. VERNON, WN.—The Farmers' Mutual Independent Telephone Company has been granted a franchise by the County Commissioners.

KNOX, WASH.—A telephone franchise has been granted to J. Arnold and associates for a local telephone which may be extended to Chehalis.

DEER LODGE, MONT.—The Intermountain Construction Company has placed orders for a complete common battery telephone plant for this place.

BERKELEY, CAL.—A 400-ply cable is to be laid along Shattuck avenue from Bancroft way to Vine street and a similar one from Bancroft way south to Derby street, by the Pacific States T. & T. Co.

MEDFORD, ORE.—The people will vote on the proposition as to whether a franchise shall be granted to the Citizens' Telephone Company, to be submitted on March 19. The franchise for the same company in Grants Pass was vetoed by the Mayor, but will be up again.

SAN BERNARDINO, CAL.—The Kellogg Switchboard & Supply Company has closed a contract with the San Bernardino Valley Telephone & Telegraph Company for complete new equipments for the towns of Uplands and Ontario. The common battery multiple harmonic system will be installed, and provisions are being made for an ultimate equipment of 3,000 telephones.

ILLUMINATION.

FULLERTON, CAL.—The Anaheim and Orange Gas companies are now combined and a central plant will be located in Anaheim.

PASADENA, CAL.—Bonds amounting to $150,000 have been issued by the City Council for the improvement and extension of the municipal electric lighting plant.

PETALUMA, CAL.—The City Trustees have set the rate for gas during the coming year at $1.25 per 1,000 feet and the rate for electricity at 12 cents per kilowatt. The minimum rate for gas is to be 75 cents, while that on electricity will be $1. The Pacific Gas & Electric Company has opposed the rates, stating that it cannot make a legal interest on its investment.

FINANCIAL.

CHICO, CAL.—The Pacific Gas & Electric Company's receipts for the past year were $13,590.80 for fuel gas, and $6,550.95 for electric power.

RENO, NEV.—The Reno Traction Company's report for the year ending June 30, 1908, shows the net earnings to have been $39,843.25, and the expenses $27,272.15, making the net profits $12,571.10.

INCORPORATIONS.

SAN LUIS OBISPO, CAL.—The Adelaide Rural Telephone Company has been incorporated here by Otto Wyss, A. A. Dubost, W. I. Davis and others.

BAKERSFIELD, CAL.—The Wrenn Oil Company has been incorporated here with a capital stock of $100,000 by J. B. Wrenn, E. W. King and John Robertson.

FRESNO, CAL.—The Diablo Oil Company has been incorporated here with a capital stock of $250,000 by L. W. Klein, O. F. Lundelius and W. H. Harris.

BAKERSFIELD, CAL.—The California King Oil Company has been incorporated here with a capital stock of $150,000 by H. B. Guthrey, A. G. Nichols and J. R. Riggins.

BAKERSFIELD, CAL.—The Manhattan Midway Oil Company has been incorporated here with a capital stock of $75,000 by S. E. Vermilyea, E. E. Edmunds and T. O. Turner.

SAN FRANCISCO, CAL.—The Mays Oil Company has been incorporated here with a capital stock of $500,000 by Thomas Wilkes, J. W. Mays, H. Layer, T. M. Reid and C. P. Kern.

COALINGA, CAL.—The Silver Top Oil Company has been incorporated here with a capital stock of $75,000 by W. R. Guiberson, Z. L. Phelps, Jacob Zwang, C. R. Cutten and R. Cook.

LOS ANGELES, CAL.—The Alvarado Oil Company has been incorporated here with a capital stock of $300,000 by C. L. Bullard, J. V. and L. H. Mitchell, A. M. F. and V. C. McCullough.

RIVERSIDE, CAL.—The Church Water Company has been incorporated here with a capital stock of $30,000 by Bertha C. and A. W. Church, J. T. Jarvis, T. D. Hewitt and S. J. Castleman.

LOS ANGELES, CAL.—The Scarab Oil Company has been incorporated here with a capital stock of $100,000 by M. H. Whittier, M. J. Connell, J. M. Kellerman, W. W. Woods and R. B. Hardacre.

FRESNO, CAL.—The Madera Oil Mining Company has been incorporated here with a capital stock of $500,000 by R. Roberts, W. B. Thurman, E. M. McCardle, W. C. Maze and J. G. Roberts.

FRESNO, CAL.—The Valley Oil Company has been incorporated here with a capital stock of $3,500 by W. H. Worswick Jr., H. S. Needham, Fred Huntzicker, F. M. Pool, Jacob Richter and others.

SAN FRANCISCO, CAL.—The Kern River Drillers' Oil Company has been incorporated here with a capital stock of $1,000,000 by J. Reynolds, J. M. Kent, William Sims, L. R. Young and M. A. Kenny.

VISALIA, CAL.—The Tulare Home Telephone & Telegraph Company has been incorporated here with a capital stock of $25,000 by E. W. Rice, G. C. Harris, B. W. Chenowth, Scott Hendricks and T. J. Franklin.